

**Impact of Mining and Industrialisation on Food Security
Livelihood and Natural Resources in Orissa
(Micro-Study in Talcher - Angul Region)**



One of the 'fly-ash pond' of NALCO, Angul, spread over 800 acres breached on 31st December, 2000 and flooded the shores of Nandira river. Even after 8 years, 'ash' is still present on the agricultural lands along Nandira and continue to affect farming activities

foreword...

On behalf of the Collective Forms of Cooperation (CFC), Eastern region, I would like to place before you the outcome of a study commissioned on the Impact of Mining and Industrialisation on Food Security, Livelihood and Natural Resources in Orissa (Micro-Study in Talcher - Angul Region) focussing on National Aluminium Company engaged in smelting of alumina powder into aluminium metals, coal mining and coal based power generation and industries. A previous study commissioned on Nalco's impact with reference to ecological debt covered a part of this area of the study but did not much relate as the current study focused on the impact on food security, livelihoods and natural resources. This study therefore helps the reader to understand more in detail relating to the whole question of mining and allied activities, and how high energy intensive consumption leads to climate change, pollution of water resources, air and agricultural lands further impoverishing the capacity of the land for increased yield, and destruction and loss of diversity of aquatic species. Furthermore, the outcome of the study is only a tip of an iceberg challenging the entire gamut of growth and development of macro economic models perceived by Governments and Corporates.

I sincerely thank Mr. Sanjay Khatua of DHARA, who led the team that was engaged in the study for the data collection and analysis. We as Civil Society organisations are supporting out this publication. We as Civil Society organisations are supporting communities in their struggle for justice and equity highlighted in the study so that they can achieve people centred sustainable development with dignity and live with harmony.

I take this opportunity to thank the members of SPAR (SPAR), Forum of Collective Forms of Cooperation Action Forum (ODAF) and Eastern Region.

William Stanley
Convenor, CFC - Eastern Region

SOCHARA

Community Health

Library and Information Centre (CLIC)

Community Health Cell

85/2, 1st Main, Maruthi Nagar,

Madiwala, Bengaluru - 560 068

Tel : 080 - 25531518

email : clic@sochara.org / chc@sochara.org

www.sochara.org

The 'whirlwind': Unlike the transient one, which disappears the next moment, the 'industrial whirlwind' has been stationary in Talcher - Angul region taking the forest and other natural resources at its sway. At the background - remnant of the thick forest along NTPC Kaniha 'ash pond'



Impact of Mining and Industrialisation on Food Security
Livelihood and Natural Resources in Orissa
(Micro-Study in Talcher - Angul Region)

Published by:

CFC- Eastern Region
C/O: ODAF, NA-204
Neelachakra Apartments
Bhubaneswar- 751 006
odafbbsr@gmail.com

October - 2008

Edited by:

Dr. William Stanley
Sanjay Khatua

Devised by

DHARA
Bhubaneswar

Members of the Task Group

Mr. K. Murali, Manager, AFPRO task force, Bhubaneswar
Ms. Rekha Panigrahi, CWS
Mr. Sankarsan Hota, ODAF/PIPAR
Mr. Bibhu Prasad Tripathy, Consultant ODAF and Advocate
Mr. Pradeep Baisakh, ODAF
Ms. Jijnaasaa Dash, ODAF
Mr. Sanjay Khatua, Independent Consultant, Team leader, Micro-study

Members of the Micro-study team

Mr. Sambit Mohanty, Technical Team (AFPRO)
Mr. Pranay Parida, Technical Team (AFPRO)
Mr. Ananda Swain, Socio-Economic Team (DHARA)
Mr. Debashis Mishra, Socio-Economic Team (DHARA)
Mr. Bibhu Prasad Tripathy, Consultant, ODAF and Advocate, Legal Aspects
Mr. Rangadhar, Local Resource Person from one of the sample villages
Mr. Sankarsan Hota, Regional Resource Person
Mr. Sanjay Khatua, Independent Consultant and Team Leader

We take this opportunity to extend our thanks to all the villagers of BaluganKhamar, Dasnali, Bagachara, Tumungala, Katarapada and Jhadiamba in Angul-Talcher region and the community leaders for their cooperation. We also thank the members of the CFC-ER, ODAF Secretariat, especially Dr. William Stanley, Convenor, CFC-ER and Mr. Saitesh Chakraborty, National Convenor, FCFC for their cooperation and guidance.

Task Group and the Micro-study Team

CFC- Eastern Region

Impact of Mining and Industrialisation on Food Security, Livelihood and Natural Resources in Orissa (Micro-Study in Talcher - Angul Region)



Bangaru-nala, source of irrigation for more than 50 villages, blocked due to coal mining activities: ecological services paid no attention

summary

Post liberalisation, the state and central governments have reinforced their focus on mining and industrialisation for a 'prosperous economy'. "Though Orisasa is rich in minerals, exploitation is still not commensurate with the potential. Enhanced rate of exploitation of different mineral reserves will not only improve the financial position of the Sate, but also will be helpful in generating sizeable direct and indirect employment", observes Socio Economic Survey, 2004 of govt. of Orissa.

But does it really happen? Does it make any good to the living standards- health, sanitation, hygiene, drinking water - of the people who live close to the mineral resources and industries; does it improve the livelihood resources they depend upon; does it better the livelihood earning systems of the communities who live in the periphery of the mining and industrial belt, or away from it; does it contribute to the various ecological services in the region; does it contribute to the resources, which are considered intergenerational? At the basic level, does it improve the food and livelihood security of the marginalised, the disadvantaged, the nature and the local resource dependent communities? We know, it is not easy to get answer and there is dearth of documentation in this context, which provides insight. The micro-study, in a small way, was intended to bridge that gap - to go to the communities, see and listen to them, how the mining and industrialisation process has impacted their lives and livelihoods.

Angul-Talcher region was purposefully selected for the micro-study, the reasons: comparatively clear manifestation of converging adverse impact induced by sustained mining and industrial activities in a compact region over more than 5 decades. Few villages were selected on the basis of observation during a pilot visit - one village from the coal mining area, one from the ash-pond area; one little away from the mining-industrial area; and one village with fishing community, far away from the mining-industrial belt. The information and observations collated in the study were generated through Focus Group Discussions (FGD) with the community, physical transect, interviews and study of the material from the secondary sources.

The 'micro-study', which we would prefer to call an 'appraisal', was constrained by number of factors, mainly resources to have in-depth, inter-disciplinary exploration. The resources available allowed only about one week of field observations to the team consisting of socio-economists; experts on soil, crop, hydro, fishery and legal aspects, including the Pilot visit. However, under the circumstances, instead of going for any in-depth vertical study, it was envisaged to touch all the possible aspects to understand the dynamics of impact on the livelihood. And the appraisal has done that, it has generated array of observations to tickle the people who still believe mining-industrialisation as the panacea to the problems in our country. In a way, it raises more questions than it answers, and suggests follow up in two major areas: in-depth balance sheet of resources and utilisation; the legal elements of fixing accountability, seeking redress when resources in large region or the intergenerational resources are irrevocably impacted.

observations and insights in brief

The Village right in the local mining area: BaluganKhamar

Over the past 16 years of mining activity, more than 90 percent revenue area of the village has been acquired - average 60 acres per year. Whatever small amount of land that has not been acquired has lost its fertility, and poor in retaining moisture - few families cultivate short duration paddy in the remaining land awaiting acquisition; no second crop is possible.

The coal-mining has devoured all the 60 acres of forest that BaluganKhamar had prior to mining (1991). As usual, the forest was one of the major source of collection of materials for the day to day livelihood- fuel wood, fodder, edibles and other non-timber-forest-produces (NTFP), both for family consumption as well as income generation. There was no compensation to the community for the loss of forest.

Easy access to fuel wood helped save time, labour and cash. In absence of forest, at present, people either collect from distant forests or buy coal for cooking. As per estimation, forest was saving Rs.10, 80,000 in a year, considering the present rate of fuel expenses - fuel expenses is reported Rs.2400 per year/family - @ Rs.200.00 per month to buy coal.

Prior to mining, BaluganKhamar had 2 water channels and 7 ponds, spread over an area of about 16.5 acres. Two natural water channels - Mahurihata-nala and Gengtia-nala, which passed through the agricultural fields of the village, and were sources of irrigation and collection of fish in rainy season, are now dead, thanks to the mining and the overburdens. With the death of the channels, the villagers have lost yet another source of livelihood.

Because of the easy access to grazing and fodder sources - forest and the common grazing land- besides cows, most families had goats and sheep. These families used to generate average Rs. 10,000 per family/year out of selling of the small animals (estimated total income Rs.45, 00,000 per year/village). At present, only 3-4 families have about 30 goats.

The 'loss', far outweighs the 'compensation'; going by the rough estimate, over the last 16 years, the villagers have incurred estimated loss of Rs.110,180,800 taking into consideration the actual production and marketing (excluding the other ecological services of the resources), against the compensation of Rs.575,00,000 (for the agricultural land and the homesteads).

Since the last 6-7 years, the coal company has been providing drinking water during the months of February to June - 2 tankers daily; water is allegedly pumped directly from the mine holes and distributed without any purification. The families, still staying in the village, have been facing acute drinking water scarcity since 1995.

The families, who still live in the village complain of increased incidence of stomach related diseases, TB, Malaria, Typhoid and Skin diseases, following the mining operation.

Dust from mining operation, the overburdens and the transport vehicles are major causes of pollution. Smoke and heat from coal burning, especially in summer months make it extremely difficult for the villagers to live in there.

Village in 'ash-pond' area - Dasnali

Prior to the 'ash ponds', about 96 families of the village had limited but fertile agricultural lands on the banks of the Brahmani and Nandira rivers - 67 families have lost 54 acres of lands (including about 50 acres of agricultural lands) to the 'ash ponds'.

About 70% families of the village have lost 54 acres of agricultural lands for construction of the four 'ash ponds'. The remaining 46 acres of multi-cropped agricultural lands at present are cultivated for paddy only in rainy season. Reason: lack of interest for cultivation, loss of fertility, increased pest attack allegedly due to pollution from the 'ash ponds' (leaching and dust), and quick loss of moisture due to prolonged high temperature (Dasnali is within about 10-15 kilometres from the mining-industrial belt of Angul-Talcher)

Prior to 'ash pond' (1988), there were about 2000 cows/bullocks, 700 buffalo and 2500-3000 goats and sheep in the village. Most families used to sell milk

@ Rs. 4-5 /litres. Families with 1-2 cows were able to earn about Rs 300-400 /month. Average selling price of the small animals was about Rs.800.

After about one decade, the village present entirely different picture- only few families sustain the practice of animal rearing, that too in very small numbers. Reason: lack of grazing land (about 4 acres of village community land at the banks of river Brahmani has been occupied for 'ash pond'), contaminated grass and water, thanks to the 'ash ponds', impacting animal health.

During dry months, especially in summer, the ashes from the 'ash ponds' fly in all directions causing skin irritations. Medical expenses has increased; villagers reported greater incidence of Malaria, TB and Typhoid .

Cattle as well as people suffer because of pollution of Nandira river, which flows adjacent to the village (cattle develop complications when they consume its water, it gives serious skin irritation when humans come in contact- Nandira carries industrial effluents from Angul -Talcher region, at times, the water gets very polluted).

Of the 96 households in the village, most have received compensation money. But only 2-3 families have used the money for buying new agricultural land and about 5-6 families have invested in business, the rest had spent the money lavishly.

Village at short distance (10-15 kms) from mining-industrial belt - Bagachara

Bagachara village on banks of Nandira river is inhabited by 40 Dalit families, 15 of them are landless and the rest are marginal farmers (most having less than one acre) having their agricultural land along the Nandira river. The village has not lost any landed property, but it is one of the examples of villages, which are never part of any compensation package but their livelihoods are directly impacted due to pollution and utter negligence. 'Goddess' turned devil overnight', members of the community of Bagachara village observed while tracing degradation of the river Nandira, which was the life line to them about three decades back.

Community far away from mining-industrial belt (35kms +) - Tumungala fisher-folk, on the banks of the river Brahmani

Following the industrial intervention in the area and the release of the mining-industrial waste to river Bramhani, the fish migration from down streams to up-streams has been decreasing significantly. The diversity has reduced, only few varieties of less economic importance - *Kalabainisi*, *Seula*, *Gadisa*, *Bijula*, *Kantia*, etc. are available in small quantities.

Now fishing families of Tumungala manage to catch average 500gm -1kg of fish per family/daily (market rate is Rs 40/kg).

Under the circumstances, almost all the families of Tumungala fishing community have changed their main source of earning livelihood - fishing (rain, winter and greater part of summer) to wage labour (daily wage rate is Rs 50-55).

Earlier, women used to go on vending fish and dry-fish; now, they too go for wage earning - construction and agricultural activities have increased and work is available round the year in the neighbouring villages.

Technical observation

The lead value in Bramhani river at Tumungala was found to be more than 0.01Mg/l even in rainy season, which would be much higher in summer months. Heavy metal pollution (like lead) decreases the reproductive capacity of the fish species, which could be one of the reasons of decline in fish catch.

Cadmium (Cd) in Bramhani water at Tumungala found to be within permissible limit (water sample tested at the Regional Research Laboratory, Bhubaneswar - presently Institute of Metal and Mineral Testing), but when it gets in to the food chain system (fish) there is danger of getting accumulated in the human body. The increase in concentration of Cd may create genetic deformities for humans and animals.

Water sample tested from the drinking water sources of BaluganKhamar and Dasnali found to have fluoride contamination.

Chromium (Cr) present in the soil (BaluganKhamar /Dasnali) would reduce the soil moisture content (necessary for the soil fertility and plant growth) and as result, the plant growth would be adversely affected. The study also investigated the effects of Cadmium (Cd) on the growth of paddy and other crops in the sample villages. More than 0.1 mg/litre of Cadmium concentration causes delay in seed germination as well as growth. The Cadmium contamination in soil during the summer days or at early rainy days (when paddy seedlings are raised) at concentrations ranging more than the 10 mg/kg can cause severe damage to rice plant. Height of Paddy plants is reported to be reduced by 30 % and the number of tillers and the rice yield declined by 30-40 %, compared to the other outer periphery of this industrial belt.

The agricultural land in the mining and 'ash pond' region found to be polluted with lead (Pb)- the samples tested revealed high concentration of lead in soil. This adversely affects the germination of seeds and shoot growth, resulting in decreased production (could be one of the factors behind farmers in the villages loosing interest in agricultural operation).

In the sample villages, the temperature during peak summer rises to more than 50° C and has already affected the cropping pattern - the quick loss of moisture does not allow the farmers to go for the second crop; the farmers used to grow vegetables in summer no more do that as it requires frequent irrigation and significantly reduces the harvesting duration rendering the operation quite unprofitable.

'Fly ash' deposit over the agricultural fields is already adversely affecting production and would be be further aggravated - production of the plants affected due to the closure of stomata pores. The plants get dried off due to lessening of photosynthesis process.

The 'fly ash' discharged through chimney and the 'ash slurry' in ponds are causing serious hazards to the ecosystem. Wind based deflation of pollutants such as 'fly ash', material from the overburdens in the collieries are flown to several kilometres depending on the velocity of the wind, and adversely affect the soil profile, even at areas located more than 10 kilometres away.

The legal dilemma

The law makes a distinction between people owning land and the landless folks by using the term 'persons interested in land' and limiting the scope of law to provide compensation to them only. With respect to compensation, the law does not lay down the basis for the determination of market value.

The idea that current generation has obligation to restrict its use of the environment in order to preserve it for the future generation has emerged as a norm in environmental policy making. One manifestation of how duties of future generation have influenced environmental policy is the way inter-generational equity fits into the main definition of sustainable development. Under the constitution, citizens have a right to a liveable environment and this right needs to be preserved at the expense of limiting people's freedom to degrade environment. The notion that each person has a fundamental and inalienable right to health as well clean environment has a strong background support basing upon the social need and the legal mandate.

In this regard, it is pertinent to ponder whether the compensation provided against the piece of land acquired by the Government at the current market rate actually compensates the loss suffered by alienation? Can the amount of money paid as onetime compensation be compared with the multifarious intergenerational benefits reaped from the landed property? Whether the losses suffered by the community through alienation of common property as well as the loss of the forest land and contamination of the environment including the breathing air and water bodies could ever be quantified and compensated by payment of the alleged market value of the land acquired?

When there are threats of serious and irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. The 'polluter pays' principle as interpreted by the Supreme court means that the absolute liability for harm to the environment extends not only to compensate the victims of pollution but also the cost of restoring the environmental degradation. Remedying the damaged environment is part of the process of 'Sustainable Development' and as such the polluter is liable to pay the cost to the individual who suffers as well as the cost of reversing the damaged ecology.

It is an affirmation of the duty of the State to protect the people's common heritage of streams, lakes, marshlands and tidelands; surrendering that right of protection only in rare cases when the abandonment of that right is consistent with the purposes of the trust. The State has an affirmative duty to take the public trust into account in the planning and allocation of water resources, and to protect public trust whenever feasible.

Moreover, the lack of any accounting process to properly quantify the damages to the ecology whose impact can be felt and spread over several generations also contributes to the ineffectiveness of the said principles despite the much hyped inclination of the courts of the country to implement the same. How far the activities of mining and industrialisation, as abetted and acquiesced by the Government in the name of development that damages the ecology in a slow, steady and irrevocable manner, leaving only a worthless and poisonous shell in the name of environment to our future descendants in terms of legacy' is a question that needs special attention of all the socially and environmentally conscious intellectuals.

If we visualize the problems and issues of concern revealed by the current 'study' in the light of the above principles and mandates, we find that environmental accounting is as important as the environmental accountability and the monetary valuation of natural resources is at the heart of integrated accounting. Although this might amount to putting a price on the priceless, without such valuation, comparison of different economic and environmental activities, processes and their interaction is not possible.

The legal regime has been characterised by the inadequacy of the regulatory mechanisms, of high cost and of the dependence on budgetary supplements from Governments. The role of economic instruments in supplementing the regulatory approach to environmental protection has only been recently rediscovered. The laws' failure also lies in its incomprehension of the fact that factors affecting sustainable development transcend mere issues of pollution control.

The broad picture

- Most of the small farm families directly affected by mining and other allied industry related activities (ash pond), and who have received some compensation (against land, homestead, and the trees in there) have turned from multi-resource dependent families to single source families (mostly wage earners)-relatively secure livelihood with multiple fall back systems to multi- vulnerability.
- These families have lost all the 'immovable assets' (land, tree) and occupational skills having intergenerational access.
- The loss (calculated on the basis of tangible benefits from land and other nature products and services), over a period of less than two decades outweighs the compensation. For example, the calculated loss (agri produces and other materials sold) is Rs.1101,80,800 over 16 years, whereas the compensation received is only Rs.575, 00,000 (land, homestead and trees on homestead).
- The livelihood of the communities, living near the mining and industrial belt, as well as the communities living far away from the mining and industrial belt, and who were never part of any compensation package, are impacted due to pollution, destruction of resources and the negative impact on the ecological services. For example, the river-fishing communities along Bramhani river are forced to change their occupation, as fishing is no more dependable due to pollution induced depletion of fish resources.
- Communities, which are not part of any benefit package, also suffer because of pollution of irrigation sources; extreme rise in temperature makes second crop difficult, productivity drops due to the degradation of the soil health; they suffer due to health complications and spend comparatively more on treatment.
- The quality of livelihood indicators (road, drinking water, health facility, etc.) is very poor in the villages who have 'sacrificed' their intergenerational assets for 'profit' generating activities.
- The affected are perplexed about where, on whom and how to fix accountability and seek redress.

Food for thought

Orissa comprises of five percent of the India's landmass and with 36.71 million people it accounts for four percent of the population of the country. While two third of the area is comprised of hilly forests, it has coastline of 480 km. State's fresh water is one of the highest in the country - 11 percent of India's total surface water resource- 663,774 hectares. The brackish water areas of the State include the Chilika lagoon- 79,000 hectares, estuaries- 2, 79,000 hectares and backwaters - 8,100 hectares. Orissa has 3,678 inland fishing villages with a population of 751,356. Eighty one percent of the state's rainfall is received during the monsoon (June- September). Of the total families who own land, 82 percent are marginal farmers- possessing less than 1 ha of land or small farmers - 1 to 2 ha. Of the total cultivable lands of the State, 62 percent are rain- fed; irrigation potential has been created for about 39 percent of the lands; 47 percent families live below poverty line- earns an annual income less than Rs.11,000.

Given this profile, most of the communities, still earn their livelihood based on the multiple products and services available in their ecological niches.

Orissa is no doubt immensely rich in the mineral resources - it has 97 percent of India's chromites and 95 percent of nickel reserves, 50 percent of its bauxite, and 24 percent of the coal reserves. Overall, it has an estimated reserve of about 5,923 million tons of 18 minerals, valued at Rs.1, 674 million in 1996 . By 2004, there were 607 mining areas in the State, covering an area of 101,947 ha. Out of these, 339 leases covering an area of 73910 ha were in operation, which included the extraction of bauxite, iron ore, chromites and manganese. Between 1993 and 2003, there was phenomenal 278 percent growth in mining and quarrying- from Rs. 7,005 to 19,489 millions; coal comprising 56 percent of the total value of the minerals produced. (Ecological debt, a case of Orissa, India, 2006). According to a study, the greenhouse gas emission of the State is one percent of the Global emissions, which would increase significantly going by the indicators of the number of MOUs signed for industries (mainly based on thermal power).

Going by experience, the collateral damage would be enormous, especially to the livelihood resource base of millions. River Bramhani is one example of appropriation of the livelihood resources due to mindless mining and industrial activities that are increasingly becoming a matter of grave concern. Bramhani with a catchments area of 39,000sq. kms and a length of 701 kms is the second

largest river of Orissa and one of the most polluted river of the State - it is one of the most polluted 10 rivers of the country, thanks to the mining and industrialization. About 40 years back Bramhani was life line to the farmers and fishermen of Anugul, Talcher, Jajpur and Bhadrakh districts - mining and industrial effluents have adversely affected the breeding and diversity of fish species, turning fishermen into daily wage labourers.

Contrary to the State's aspiration of boosting the employment and livelihood through the mining-industry way, between 1990 and 2001, output of minerals went up by 121 percent, but the number of workers directly employed fell by 20 percent. For every one ha of land mined, only 1.6 workers are employed. The districts of Orissa having most of the mines, such as Jajpur, Keonjhar, Dhenkanal, Anugul, Jharsuguda, Sundergarh, Mayurbhanja and Koraput also have most of the marginal families- while population of Adivasi and Dalits range from 29 to 62 percent (State average 38 percent), the marginal farmers constitute 76 to 85 percent (State average 82 percent) (Ecological debt, a case of Orissa, India, 2006).

There are also tell-tale signs indicating large part of the State being pushed to multi-vulnerability. For over a decade, Orissa has been teetering from one extreme weather condition to another: from heat wave to cyclone, from drought to flood. The State has been declared disaster affected for 95 years out of the last 105 years: floods have occurred for 50 years, droughts for 32 years. Since 1965, these calamities have not only become frequent, they are striking areas that have never experienced such conditions before. (see Orissa Vulnerability Factsheet at the back page). Most of these are attributed to mining-industry and wanton destruction of forest and other resources induced climate change and other degradations.

The implications would be enormous with large percentage of the population living in various eco-systems, and their livelihood and lifestyles are rooted to their local environments. The communities are not cause of the problem; but they will be ones most vulnerable to its ill effects. But far from learning from experience the mad rush to follow the mindless mining-industry path still remains unabated. Unless we adopt a model of development that takes into consideration the carrying capacity of the earth, we will not be able to address the climate issue, the livelihood issue, the development issue and our responsibility to the generation present and next. "The crisis we face demands a profound philosophical discussion, a reappraisal of who we are and what progress means. Debating these matters makes us neither saints nor communists." (George Monbiot)

Impact of Mining and Industrialisation on Food Security, Livelihood and Natural Resources in Orissa (Micro-Study in Talcher - Angul Region)

1. Context

- The media and various studies are replete with observation that large sections of the community living far and near the mining and industrialised belt are least benefited while their sources of livelihood are adversely impacted. The process has created serious ecological problems with long-term implications for the future generations. In Orissa, because of the coexistence of poor living conditions of greater percentage of the population and the rich mineral resources, mining and industrialisation has been an emotional issue since long. While some sections believe and claim that mining and industrialisation could bring in the much awaited economic improvement, the ground realities project a different picture; the plight of the communities across diverse ecological niche - destruction of sources of livelihood of farmers, fishermen, forest dwellers and so on. The dynamics of mining and industrialisation and their impact on the communities living far and near assumes even greater importance in the context of unprecedented interest of the State for exploitation of mineral resources and setting up of industries.
- Forum for Collective Forms of Cooperation (FCFC), a national network of Civil Society Organisations with three regional chapters has long been in the process of understanding the dynamics of sustainable livelihood, ways and means for more equitable and balanced development without adversely affecting the ecology. The proposed study intends to gain first-hand insight to some of the basic issues relating to the livelihood of the communities living far and near of the mining and industries belt to help better understand the larger scenario.

- The micro-study is purposefully located in the Angul-Talcher region as it has the dubious distinction of being one of the most polluted industrial zones in India with number of large-scale industries and their mines- National Aluminium Company Ltd. (NALCO), Mahanadi Coal Fields Ltd. (MCL), National Thermal Power Corporation (NTPC- with two units, Kaniha and Talcher Thermal Power Station-TTPS, merged with NTPC in June 1995); Fertilizer Corporation of India unit at Talcher (closed in 1999 after operation of about two decades), and other major Central PSUs. Host of other industries and mining companies include Monnet Ispat and Energy Ltd. (mining, thermal power and steel), Jindal Steel and Thermal Power Plant, Kalinga Coal Mining Ltd., Utkal Coal Mining Ltd., Tata Sponge Iron, Essar Power, etc.
- Understanding of the livelihood dynamics assumes further importance, as about 607 mining leases have been given by the State govt. for an area of 101,947 hectares (Economic Survey, Govt. of Orissa, 2005) and it is estimated that only 1.6 workers get employment per one hectare area mined, which is at present witnessing decreasing trend with increase in mechanisation. In a way, the micro-study mirrors the state of livelihood and the future scenario in the mining-industrial belt and the ecological niche in general.



Threatened livelihood of the fisher-folks: NTPC - Kaniha drains its effluents to Tikira tributary of river Bramhani



'Ash pond' under construction right on the banks of the river Bramhani, near Dasnali

2. Aim

- To generate a critical overview relating to impact of mining and industrialisation on food security, and livelihood in Orissa from community perspective to help in understanding and positioning in context of the accelerated State inclination towards mining and industrialisation both in the hilly and coastal areas of the State.

(Terms of Reference including objective, methodology, scope in the annex)

Brief profile of the sample villages

- i BaluganKhamar, Gram Panchayat- Kandal, Block Talcher, District Angul. Multi-community village with total 450 pre-mining households, out of which 350 have already shifted to different places following acquisition of their landed property, the rest would shift soon. The village within the area of Lingaraj coal mines under Mahanadi Coal Ltd. has lost most of its resource base - land, forest, water bodies, agricultural practices, community life and culture.
- ii Dasnali, Gram Panchyat - Santhapada, Block - Talcher, District Angul, total household - 96. The village on the shores of the river Bramhani, has three 'ash ponds' belongingS to NALCO and TTPS within its revenue area and the surroundings. Thanks to the 'ash ponds' it has lost most of its multi-cropped fertile agricultural land, community land and the practice of animal rearing.
- iii Bagachara, Gram Panchayat - Santhapada, Block - Talcher, District - Angul, total household- 50 (all Dalit). The village located along 'river Nandira', which has turned into virtual drainage for different industries, including NALCO. The agricultural activities have been severely affected due to the pollution of its water.
- iv Tumungala, Gram Panchayat - Kulei, Block - Kaniha, District - Angul, total household - 110, including 20 households of the Fishing community. Fishing community of this village located at lower Samal barrage (about 30 kilometres from NTPC, Kaniha) region of the river Brahmani has been deprived of their traditional occupation of fishing and forced to change their occupation because of large-scale depletion of fish resources - both volume and diversity due to industrial pollution.



Abandoned village, Lingaraj Coal Mines area

3. Observation from the Micro-Study



Coal Mines at BaluganKhamar: Smoke, dust and the run-off from overburden contribute to contamination of soil and water health complications, temperature rise, soil infertility, loss of production

3. 1. Impact on livelihood resources

3.1.1. BaluganKhamar

- Over the past 16 years of mining activity, more than 90 percent revenue area of the village BaluganKhamar has been acquired - average of 60 acres per year. Prior to mining, there were 450 families, 15 of them were landless. The land-owning families had 1.5 acres of agricultural land in average. Except 60 acres of land, which is under process of acquisition, 90% of the agricultural lands have gone to the mining between 1991 to 2005.

Over the past 16 years of mining activity, more than 90 percent revenue area of the village BaluganKhamar has been acquired - average of 60 acres per year.

- Prior to mining (1991), BaluganKhamar had about 60 acres of forest in two patches within its revenue area - all of it has gone under mining.
- Whatever small amount of land that has not been acquired has lost its fertility and poor in retaining moisture owing to destruction of forest for mining, and casting of mining dust during operations and from the overburdens. Few families at present cultivate short duration paddy in the remaining land waiting for acquisition; no second crop is possible.

The land waiting for acquisition has lost its fertility and poor in retaining moisture owing to destruction of forest for mining and casting of mining dust during operations and from the overburdens. Few families at present cultivate short duration paddy; no second crop is possible.

BaluganKhamar, timeline of loss of livelihood resource base and impact

(Source of information - FGD with the villagers, BaluganKhamar)

Particulars	Timeline	Major event / impact
Land acquisition	1991	<ul style="list-style-type: none"> ● 10% of the total revenue area acquired.
	1992	<ul style="list-style-type: none"> ● Additional 20% of the total revenue area acquired. ● Acquisition of forest and community land started.
	1993	<ul style="list-style-type: none"> ● Additional 40% of the total revenue area acquired. ● Acquisition of forest and community land, mostly completed.
	2005	<ul style="list-style-type: none"> ● Additional 20% of the total revenue area acquired.
Compensation for land	1991	<ul style="list-style-type: none"> ● One time cash compensation provided for Homestead lands @ Rs75,000/ acre and Rs.25,000/acre for agricultural lands.
	1993	<ul style="list-style-type: none"> ● Compensation money increased from Rs.25,000/acre to Rs50,000/ acre for agricultural lands.
	2003	<ul style="list-style-type: none"> ● Compensation money increased from Rs.50,000/acre to Rs2,00,000/ acre for agricultural lands.
	2004	<ul style="list-style-type: none"> ● Compensation money increased from Rs.75,000/acre to Rs6,25,000/ acre for homestead lands.

Environmental impact	1991	<ul style="list-style-type: none"> ● Pollution of air, water table went down immediately after the mining operation. ● Increase in temperature felt immediately after the mining operation and has been steadily rising.
	1992	<ul style="list-style-type: none"> ● Mining overburdens created. ● Dust layer on water surfaces and dust coating on soil, especially in summer observed. ● Quick loss of soil moisture, fertility dropped and the 2nd crop (winter) became difficult.
Reduction of livelihood activities	From 1991 onwards	<ul style="list-style-type: none"> ● Agricultural production dropped significantly ● Production and income from traditional sources like agriculture (cropping pattern changed, diversity lost), forest collection, animal resources and agricultural wage earning reduced substantially and gradually stopped. ● People started selling their animal resources, a major source of earning and asset for emergency situation. Prior to mining, most families had 2 - 3 cows and 8 - 10 goats. Average annual income from goat selling was Rs. 3000-4000/family. ● Natural water channels and surface water bodies were lost to the mining. Prior to 1992, most of the families were getting around 4 kg of fish in a week from tural water bodies.
	1992	<ul style="list-style-type: none"> ● Collection from forest such as fuel wood, edibles and other NTFP could not be possible following mining in the forest areas.
	2000	<ul style="list-style-type: none"> ● Prior to 1991, water was available at a depth of about 20ft in village wells below ground level, even during summer; since 2000, these wells dry up at the beginning of January.
Impact on quality of life	1991 onwards	<ul style="list-style-type: none"> ● Substantial increase in the incidence of respiratory, skin and gastro-intestinal diseases. ● Village connecting road remains submerged during rainy season, since 1993. ● Drinking water problem became severe by 2000, the coal company began supplying of water - allegedly directly lifted from the mining holes - by tanker in summer, observed the villagers.

BaluganKhamar - Balance sheet of resources lost

(Source of information: FGD with the villagers, BaluganKhamar)

Resources	Pre mining period- before 1991 (approx. amount)	Post mining period (by 2007)
● Agricultural land	600 acres	10% exists
● Homestead land	100 acres	20% exists
● Forest land	60 acres	No forest land
● Community land:		
- grazing land	30 acres	No grazing land
- funeral ground	3.5 acres	6% exists
- pond	16.5 acres (7 ponds - 2 - 3 acres each)	No ponds
- well	40 (30 private and 10 Govt.)	10% exists (dries in early summer)
- drainage channel (natural)	2	No drainage channel (closed by mining dumping)
- temple	one 'Kali' temple	No temple, gone in the mining area
- socio-cultural place	2 acres open place with a stage for socio-cultural activities	Place exists, no celebrations



Forced to change the traditional occupation due to pollution of river Bramhani - women from fishing community now supplement the sagging income through collection of leaves from forest and wage earning (Tumungala, Kaniha).

'Nationalised' Nightmare

While the coalfields are a blessing for a nation raring to industrialise, it is a curse for the residents. Pollution levels are very high, be it air or water. Land degradation has reached alarming levels due to opencast mining. About 60 percent of the coal produced comes from opencast mining that is cheaper and less prone to the kind of accidents that happen in underground mines. But opencast mines leave the environment in a shambles, especially as there is no effort to reclaim land. The increasing reliance on opencast mining has brought down the number of jobs in coalmining from 674,000 in 1988 to 655,000 in 1993. The problem of large-scale displacement of poor people is the inevitable corollary of the changeover to opencast mining. Already 35,000 people of 27 villages have been displaced to make way for the Ananta, Kalinga, Lingaraj, Bharatpur and South Balanda coalmines in Orissa. Thousands more will be uprooted in the days to come in view of the massive expansion of mining in the area. Those who remain get a worse deal. Coal dust and high levels of air pollution due to the operation of power and steel plants make the air a strange mix of the carcinogenic and the unbreathable.

The landscape is now dotted with artificial hills - the soil removed during mining is dumped nearby in the form of huge mounds, threatening the existence of hundreds of villages. This year itself, 26 million cubic metres of solid waste would be dumped over 1,015 hectares of land, according to the Environment Management Plan for Angul-Talcher Area, prepared by Kirloskar Consultants Ltd of pune in 1994. The useless soil on the upper part of these mounds runs off with rainwater to nearby farms, reducing the already depleted soil fertility. According to an estimate, about 1,012 hectares of land will be wasted and 250 million cubic metres of soil dumped as overburden through open-cast mining in Angul-Talcher coal belt. The largest reserve of fuel-grade coal in India and the second largest coalfield in terms of production, it has kickstarted a mad rush of thermal power plants and aluminium plants in the area. The result: it is one of the 14 most polluted places in India, according to the Central Pollution Control Board. Opencast mining, which accounts for 95 per cent of mines in Orissa, has already destroyed the ground above.

(A Nationalised nightmare, Down To Earth, 15/07/2000)



NTPC Kaniha : 'power to pollute'

3.1.2 Dasnali

The village located on the banks of river Brahmani is surrounded by 'ash ponds' of NTPC /TTPS and NALCO. First ever 'ash pond' in this area was constructed in 1988, in the neighbouring village. Now there are 3 'ash ponds' within the revenue area of Dasanali. Prior to the 'ash ponds', 96 families of the village had limited but fertile agricultural land on the shores of the Brahmani and Nandira rivers. As reported, 67 families have lost 54 acres of land (including about 50 acres of agricultural land) to the 'ash ponds'.

Prior to the 'ash ponds', 96 families of the village had limited but fertile agricultural land on the shores of the Brahmani and Nandira rivers. 67 families lost 54 acres of land to the 'ash ponds'.

3.1.3. Bagachara

Bagachara village on the shores of Nandira river is inhabited by 40 Dalit families, 15 of them are landless and the rest are marginal farmers (most having less than one acre), having their agricultural land along Nandira river. The village has not lost any landed property, but is one of the examples of villages which were/are never part of any compensation package but their livelihood is directly impacted due to pollution and utter negligence. The water of Nadira was highly polluted when Fertiliser Corporation of India and NALCO (initially) released their untreated sewerage directly to Nandira (Bagachara village along Nandira river, is 5kms away from TTPS, 8-9kms from FCI and 12-13km from NALCO).

Bagachara village on the shores of Nandira river has not lost any landed property, but is one of the examples of villages which were/ are never part of any compensation package but their livelihood is directly impacted due to pollution and utter negligence.

Time line of pollution of Nandira and impact on Bagachara

(Source of information: FGD with Bagachara village community)

Reported time	Major event / impact
Prior to pollution	● People were using water from Nandira river for all domestic use and irrigation.
1965 onwards	● Pollution of Nandira started in around 1965, when TTPS started discharging its 'ash' to it, which was further aggravated around 1975; the Fertiliser Corporation of India (FCI) also started releasing its effluents to it, followed by - NALCO (it released untreated effluents initially), turning Nandira into virtual drainage and unfit for any domestic consumption, even irrigation - a black layer used to cover the fields; cattle would develop limping problem and suffer from various diseases out of drinking its water (many died during that period); people suffered from skin irritation and stomach problem. Wide range of crop diversity and farming practices were lost during this period and never revived when situation slightly improved after closure of the FCI.
2004 onwards	● Following closure of FCI in 1999 and TTPS and NALCO released the 'ash slurry' to the 'ash ponds', water of Nandira appeared relatively 'cleaner'. But at times TTPS and NALCO continue to discharge polluting substances to the Nandira river, observed the villagers. Once the agricultural practice was lost following pollution induced problems people shifted to other occupations and farming could not be restored - at present nothing is cultivated along river Nandira. Few families who have some lands away from Nandira are cultivating paddy; otherwise daily wage (in construction, industrial or mining activities) is the prime source of income (wage rate of Rs 60 /day).

3.1.4. Tumungala

Tumungala village along river Bramhani is inhabited by 110 families, including 20 from the fishing community. This village, located 5kms down stream Samal barrage and about 40 kms away from NTPC, Kaniha is another example of how people, who were never part of any compensation package are directly affected due to the industrial pollution of the river water - the fish catch has drastically come down due to decreased migration of fishes, adverse condition for fish breeding and mass death owing to pollution, depletion in fish diversity as well as volume. Compelled under the circumstances, the fishing-families no longer depend upon fishing; many have turned into daily wage earners.

3.2. Impact on livelihood

3.2.1. BaluganKhamar : 'Loss' outweighs 'compensation'



BaluganKhamar : places of socio- cultural importance being devoured by the mines (L), Mining overburdens looming large in the skyline where once stood dense forest (R)

Onetime monetary compensation was provided to the families having *patta* land (agriculture and homestead). In 1991, a lump sum amount of Rs.10, 000 was provided to families having no *patta* or homestead land, later on, compensation was given only to the families having *patta*.

Year	Amount of of compensation		
	Homestead land (Rs./ acre)	Agriculture land (Rs./ acre)	Forest/community land (Rs./ acre)
1991	75,000	25,000	No compensation provided
1993		50,000	
2003		2,00,000	
2004	6,25,000		

Estimation of loss: Agricultural Production

In BaluganKhamar, 97% families had some amount of agricultural land. Prior to 1991, about 50% families had food security for 6 - 8months, 35% for 8 - 10 months and 15% families could manage the entire year from their own agricultural production. The agricultural lands of the village comprised of the following: 60% low land, 30% medium & 10 % up land with wide range of cropping pattern. People had opportunity to use their land for multiple crops - Kharif paddy was followed by varieties of pulses and oil-seeds, such as gram (*chana*), red gram (*harada*), mustard, green gram (*muga*) and sesame, etc. Apart from

agricultural production, the lands were used for grazing, collection of fodder and edible greens.

As per rough estimate done by the villagers during the FGD, the harvest from the agricultural land in a typical year was worth Rs.10, 73,800 (Rs.10, 50,000 from paddy and Rs 23,800 from Pulses & Oilseeds- as per 1991 price).

As per rough estimate of BaluganKhamar, the harvest from the agricultural lands in a typical year was worth
Rs.10, 73,800 (1991 price).

Estimated loss: Agricultural production and value

Crops	Area cultivated (in acre)	Yield rate per acre	Total production (in kg.)	Unit price per kg. (Rs.)	Total market value (Rs.)
Long variety paddy	350	1400	4,90,000	1.50	7,35,000
Medium variety paddy	200	900	1,80,000	1.50	2,70,000
Short variety paddy	50	600	30,000	1.50	45,000
Gram (<i>Chana</i>)	4	250	1,000	5.00	5,000
Arhar (<i>Harada</i>)	3	175	525	12.00	6,300
Green gram (<i>Muga</i>)	3	200	600	10.00	6,000
Mustard	1	100	100	10.00	1,000
Rasi	4	75	300	15.00	4,500
Horse gram (<i>Kolath</i>)	2	100	200	5.00	1,000
				Total	10,73,800

Estimation of loss: Homestead land

Prior to mining, before the families of BaluaganKhamar lost their homesteads, and before the problem of mine-dust and water scarcity, most of the families used to grow varieties of vegetables during rainy and winter seasons - many of them used to sell the surplus. Many had fruit bearing trees in their backyards, who also used to sell along with consumption within the family.

Estimated loss: Production from homesteads / backyards

Particulars : vegetable / trees on the homestead	Average income per family (excluding own consumption)	No of family reported selling/ total income
Brinjal, Ladies finger, Ridge gourd, Onion, Chilli, Cabbage, Tomato	Rs. 400	100 families/ Rs. 40,000
Mango, Drumstick, Lemon, Sour Orange, Guava, Wood-apple	Rs. 800	130 families/ Rs. 1,04,000
Total		Rs.1,44,000

Estimation of loss: Forest

The coal-mining has devoured all the 60 acres of forest BaluganKhamar had prior to mining (1991). Sal was the dominating species along with varieties of trees of socio-economic importance - *Kendu*, *Mahula*, *Chara*, *Asana*, *Kurei*, *Kuruma*, *Babada*, *Harida* , *Dhaura*, Mango, etc. As usual, the forest was one of the major source of collection of materials for the day to day livelihood - fuel wood, fodder, edibles and NTFP, both for family consumption as well as income generation. The collection from the forest included wide range of materials, such as *mahula* flowers and seeds, *chara*, *kendu*, mushroom, *pitalu*, *sal* leaves and mango,etc.

There was no compensation to the community for the loss of forest.

The coal-mining has devoured all the 60 acres of forest of BaluganKhamar, which was one of the major sources of collection of materials for the day to day livelihood. There was no compensation to the community for the loss of forest.

Estimated loss: Collection from the forest

Type of use / collection	% family
Fuelwood collection	100
Grazing	100
<i>Mahula</i> flower	06
<i>Tola</i> (<i>Mahula</i> seeds)	06
Mango	100
Mushroom	100
Sal leaves	100
Sal fruits	15
<i>Chara</i>	05
<i>Bhadalia saga</i> (greens)	05
<i>Pitalu</i> (wild tuber)	05

Easy access to fuel wood helped save time, labour and cash. In absence of forest, at present, either people collect from distant forests or buy coal for cooking. As per estimation, forest was saving Rs.10, 80,000 in a year, at the present rate of fuel expenses - fuel expenses is reported Rs.2400.00 per year @ Rs.200 per month to buy coal. Loss of forest also meant loss of the source of direct income for the land less families, as the table below shows.

In absence of forest, people either collect fuelwood from distant forests or buy coal for cooking. As per estimation, forest was saving Rs.10,80,000 in a year, at present fuel expenses is reported Rs.2400 per family/year @ Rs.200 per month to buy coal.

Direct income from the sale of the forest produces (1991)

Items sold	Average income from selling (excluding own consumption)	Total family reported selling / total income
Ambula*	Rs. 200	30 families - Rs 6,000
Mushroom	Rs 100	10 families - Rs. 1,000
Sal leaves	Rs 150	10 families - Rs 1,500
Total Income		Rs.8,500

*type of mango pickle

Along with the forest, BaluganKhamar has also lost 30 acres of grazing land along with varieties of trees/plants (*Sal, Kendu, Mahula, Chara, Asana, Kurei, Kuruma, Bahada, Harida, Dhaura, Amba*, etc.). The grazing land was yet another common resource, which provided varieties of livelihood services. The village received no compensation against it.

Estimation of loss: Water channels and ponds

Prior to mining, BaluganKhamar had 2 water channels and 7 ponds spread over an area of about 16.5 acres. Two natural water channels - Mahurihata-nala and Gengutia-nala, which passed through the agricultural fields of the village and were the source of irrigation and collection of fish in rainy season - are now dead, thanks to the mining and the overburdens. With the death of the channels, the villagers lost yet another source of livelihood resources- varieties of fish, such as, - *Kerandi, Kathua, Kari, Dandei, Bhidi, Seula, Balia, Chingudi*, etc. over about 7 months in a year; July-January, 2-3 times a week, 3-4kg each time. About 20 families used to generate average Rs.1000 per year from dry-fish preparation.

The common ponds used to be auctioned - about 50 auction holders would carry out pisci-culture and generate annual income of Rs.60, 000.

BaluganKhamar had 2 natural water channels and 7 ponds spread over an area of about 16.5 acres. Two natural water channels, which passed through the agricultural fields of the village and were the sources of irrigation and collection of fish in rainy season are now dead, thanks to the mining and the overburdens.

Estimation of loss: Livestock

Prior to mining, most families had 2-3 cows, milk was mostly used for family level consumption and the dung as manure. Because of the easy access to grazing and fodder sources - forest and the common grazing land- besides cows, most families had goats and sheep. These families used to generate average annual income of Rs.10,000 per family from selling of the small animals (estimated total income Rs.45,00,000). At present, only 3-4 families have about 30 goats.

Because of easy access to grazing and fodder sources, besides cows, most families had goats and sheep - average annual income was Rs.10,000 per family/year from selling of small animals.



Road to Balugankhamar (L) gets submerged during rainy season; Burning coal contributes to environmental problems

Estimated total loss per year from all sources

SL no.	Type of loss estimated (1991 price) (note: 'sold', excluding self consumption)	Amount of estimated loss per year (Rs)	Remarks
1	Agri. produces (total value,1991)	10,73,800	Rs.40,500,000 received as compensation against 540 acres - see table below for details
2	Produces from homestead (sold)	1,44,000	Rs. 17,000,000 received as compensation against 80 acres- see table below for details
3	Forest (sold)	8,500	
4	Fuel (value of quantity purchased at present)	10,80,000	
5	Fish(sold)	20,000	
6	Fish pond (fish sold)	60,000	
7	Livestock (sold)	45,00,000	
8	Total	68,86,300	
9	Estimated loss in 16 years	110,180,800	

Details of Compensation received against agricultural and homestead lands

Type of land	Compensation received	Remark
Agriculture	45,00,000	1991 @25,000/ acre - 180acres
	120,00,000	1993 @50,000/ acre - 240 acres
	240,00,000	2005 @2,00,000/ acre -120 acres
Homestead	45,00,000	1991 @75,000/ acre - 60 acres
	125,00,000	2004 @6,25,000/ acre - 20 acres
	575,00,000	

The 'loss' far outweighs the 'compensation', going by the rough estimate, over the last 16 years, the community of BaluganKhamar have incurred estimated loss of Rs.110,180,800 taking into consideration the actual production and sell (excluding the other ecological services of the resources), against the compensation of Rs.575,00,000 (for the agricultural land and the homesteads)

Over the last 16 years, the community of BaluganKhamar have incurred estimated loss of Rs.110,180,800 taking into consideration the actual production and sell (excluding the other ecological services of the resources), against the compensation of Rs.575, 00,000 (for the agricultural lands and the homesteads).

Being landless in mining area : Uncertainties gallore

Mr. Pitabas Behera, aged 47 years, landless, of BaluaganKhamar belongs to the 'fishing community' and manages family of 8 members - includes five daughters and a son - by working as daily labourer in agriculture or construction activity. His forefathers had come to the village to work in the agricultural fields of the King. He doesn't have *patta* even for the land where his family stays, hence, not sure of getting any compensation.

Prior to mining, he used to earn his livelihood mainly through wage earning, growing vegetable at the home site, collections from forests and village community land.

Prior to mining (1991), daily wage was Rs.15/day. In rain and winter, he used to work in the agricultural fields of his own village (land preparation, transplanting, weeding, cutting and harvesting), whereas in summer, he used to work as construction labourer (sometimes, daily wage labourer in the near by mines).

At present, he gets Rs. 50 as wage for agricultural activities and Rs. 60 for construction activities, all of which adds up to annual income of about Rs.15,000. Out of which, about Rs. 12,000 is spent over food, Rs. 2000 for dress materials, Rs. 500-1000 for health and Rs 500 for conveyance, etc. He seldom manages to save anything out of the income and often borrows small amount from friends & relatives. His eldest daughter has reached the age of marriage, Pitabasa wonders how he would manage the marriage expenses, at least Rs. 50,000.

3.3.1. Quality of life : BaluganKhamar

- Till date, about 80% families of BaluganKhamar have shifted to different places as per their own convenience. They have not been provided with any land or other accompaniment.
- Wage in construction and transport sector, collection of coal from the overburdens and selling to the hotels or other private consumers (not legal) are at present some of the main sources of income for most of the families who have shifted.
- Apart from compensation for agricultural land and homestead land (including the permanent trees in there), the coal company provided no other facilities - road, school, health, etc - in the places of resettlement. Existing road to the village remains submerged in rainy season. The village had electricity prior to mining.
- Since the last 6-7 years, the coal company has been providing drinking water during the months of February to June - 2 tankers daily, water is allegedly pumped up directly from the mine holes and distributed without any purification. The families, still staying in the village, have been facing acute drinking water scarcity since 1995.
- The families who still continue to live in BaluganKhamar, complain of increased incidence of stomach related diseases, TB, Malaria, Typhoid and Skin diseases, following the mining operation.
- Dust from mining operation, the overburdens and the transport vehicles are major causes of pollution. Smoke and heat from coal burning, especially in summer months make it extremely difficult for the villagers to live in there.
- Out of 450 families in the village, almost 350 have shifted to other places (own initiative) and have constructed new houses utilising the compensation money. Some families used the compensation money for loan payments or lived lavishly for few years. Once the money was exhausted there was no alternative other than wage. Less than 10% people used the money to buy new agricultural land or invested in some business. Displaced families without job face problems for marriage of their sons and daughters (no landed property

means lower social status)

- Temperature has been steadily increasing following the mining operation in the area, so does the dust pollution and cases of drying up of the open wells and other water sources. Dust and smoke generated from mining operation and burning of coal contribute to make the surrounding hazy, especially in summer. Overburden (OB) have been formed since 1992. Some plantation was carried out on OB in 1993, without any involvement of the community.

The coal company provides drinking water during the months of February to June - 2 tankers daily, water is allegedly pumped up directly from the mine-holes and distributed without any purification. The families complain of increased incidence of stomach related complications, TB, Malaria, Typhoid and Skin diseases. Smoke and heat from coal burning, especially in summer months make it extremely difficult for the villagers to live in there.



NALCO water mining from the river Bramhani - intake pumphouse near Dasnali village

3.3.2. Dasnali: Livelihood scenario

- Dasnali village located on the banks of river Brahmani saw the first ever 'ash pond' constructed in the region in 1988 - at present there are 3 'ash ponds' in and around its revenue boundary.
- Prior to the construction of the 'ash ponds', about 96 families of the village had about 100 acres of fertile agricultural land on the banks of the river Brahmani and Nandira.
- About 70% families lost 54 acres of agricultural land for construction of the for 'ash ponds'. The remaining 46 acres of multi cropped agricultural lands are at present cultivated only for paddy during kharif season. Reason: lack of interest for cultivation, loss of fertility, increased pest attack, allegedly due to pollution from the 'ash ponds' (leaching and dust) and quick loss of moisture due to prolonged high temperature.

Prior to the 'ash ponds', about 60 % families had food security for 6 - 8months, 30% for 8 - 10 months and 10% families throughout the year out of their own agricultural production.

Deadly cocktail

Environmental destruction is taking a heavy toll on public health. A survey by the Bhubaneswar-based Orissa Voluntary Health Organisation reveals that people living near coalfields are more vulnerable to stomach and respiratory disorders than those living away from them.

Ten billion litres of groundwater is pumped out everyday in the coalfields of Talcher and Ib Valley, drying up aquifers in an area of 1,000 sq km.

In Dasnali, about 70% families lost 54 acres of agricultural land for construction of three 'ash ponds'. The remaining 46 acres of multi cropped agricultural lands are at present cultivated only for paddy during khariff season. Reason: lack of interest for cultivation, loss of fertility, increased pest attack, allegedly due to pollution from the 'ash ponds' (leaching and dust) and quick loss of moisture due to prolonged high temperature.

Livestock

- Prior to 'ash pond' (1988), there were about 2000 cows/bullocks, 700 buffalo and 2500-3000 goats and sheep in the village. Most families used to sell milk @ Rs 4-5 /litres. Families with 1-2 cows were able to earn about Rs. 300-400/month. Selling price of the small animals was about Rs.800.
- After about two decades, the village present entirely different picture- only few families sustain the practice of animal rearing, that too in very small number. Reason: lack of grazing land (about 4 acres of village community land along the banks of river Brahmani have been occupied for 'ash pond'), contaminated grass and water thanks to the 'ash ponds' impacting animal health, observed the villagers of Dasnali.



The Dasnanli village community use polluted water from river Bramhani, an elder person showing sample(L), to contain the 'fly ash' from 'flying' in summer, Ipomoea (weed) has been planted in one of the 'ash-pond' very close to the habitation, which work as 'mosquito breeding' place making life of the villagers miserable (R)

Prior to 'ash pond' (1988), there were about 2000 cows/bullocks, 700 buffalo and 2500-3000 goats and sheep in the village. Most families used to sell milk @ Rs 4-5 /litres and earn about Rs 300-400 /month out of 1-2 cows. After about two decades, the village present entirely different picture- only few families sustain the practice of animal rearing, that too in very small number.

Estimation of Agricultural production in the land lost to the 'ash ponds'

Season	Crops	Cultivated area (acre)	Yield per acre (kg)	Total production (kg)	Present market price(Rs/kg)	Total value (Rs)
Rain	Kharif paddy	40	1500	60,000	03	180,000
	Ragi	05	400	2,000	05	10,000
	Arhar	05	400	2,000	12	24,000
Winter	Buta (pulses)	15	200	3,000	12	36,000
	Jada (castor-oilseed)	2.5	100	250	15	3,750
	Biri (blackgram)	05	250	1250	30	37,500
	Muga (greengram)	15	200	3,000	25	75,000
	Kandamula (sweetroot)	05	500	2500	03	7,500
	Rasi (oilseed)	05	400	2,000	30	60,000
	Baigan (brinjal)	2.5	2000	5000	07	35,000
	Summer paddy	30	1875	56,250	03	168750
Total						6,37,500

Loaded water of river Bramhani

Orissa Pollution Control Board's (OPCB) survey of pollution in the Brahmani river, conducted in September 1998, clearly mentioned the heavy metal content of the mines discharge, stating that "the chromite mines in the area discharge waste water rich in hexavalent chromium," a known carcinogen. The 21 mines in the Talcher- Angul area discharge 29,434 kilolitres of such heavy metal-laden water into the river. In 1989, the Bangkok-based Asian Institute of Technology, in collaboration with the OPCB, investigated the impact of mines and industrialisation on residents living near by. It observed, "The concentration of some heavy metals were higher than the standards in mine discharge."

A Nationalised nightmare, Down To Earth 15/07/2000

Quality of life

- The village does not have any safe drinking water facility, people use water from river Bramhani round the year. NALCO provides drinking water for 2-3 months - 1 tanker daily. It also organises fortnightly health camps, which is not taken seriously by the villagers due to poor quality of service (similar medicines for all diseases, most present in the FGD observed).
- During dry months, especially in summer, the 'ashes' fly in all directions causing skin irritations. Medical expenses has increased; villagers reported greater incidence of Malaria, TB, Typhoid.
- Cattle as well as people suffer because of pollution of Nandira river which flows adjacent to the village, Cattle develop complications what they consume

its water, it gives serious skin irritation when humans come in contact - Nandira carries industrial effluents from Angul -Talcher region, at times the water becomes extremely polluted.

- Of the 96 households in the village, most have received compensation money. But only 2-3 families have used the money for buying new agricultural land and about 5-6 families have invested in business, the rest spent the money lavishly.

During dry months, especially in summer, the 'ashes' from the 'ash pond' fly in all directions causing skin irritations. Medical expenses has increased; villagers reported greater incidence of Malaria, TB, Typhoid. Cattle as well as people suffer because of pollution of the Nandira river which flows adjacent to the village. Only few families of Dasnali who received compensation money had invested in buying new agricultural land.

Madhab Sahu: 'Ash pond' and the insecurity in livelihood

Madhab Sahu, aged 43, of Dasnali lives with his wife and four children. Prior to 'ash pond', he had 4.5 acres of agricultural land. During 2003, NTPC/TTPS acquired 3 acres of his agricultural land on the banks of river Brahmani for construction of 'ash pond', against total compensation of Rs.8, 00,000. Prior to 2003, he was mainly living out of cultivation, livestock and part time contract work at TTPS.

The 3 acres of land occupied for the 'ash pond' was multi cropped land with lift irrigation facility from the river Brahmani. He used to cultivate summer paddy using the lift irrigation facility. After own consumption, he was getting about Rs.20,000 per annum from the selling of agricultural produces, observed Madhab.

Madhab had 4 cows and the family used to generate about Rs.12, 000 per annum from selling of milk. Grazing was not a problem, thanks to the open banks of Brahmani and the agricultural lands in and around the village.

People could not utilize their compensation money properly as they had no alternative plan for livelihood, observed Madhab. In his village, the compensation he got was the highest (Rs.800,000). One wise thing he did with the money was to purchase one acre of agricultural land at cost of Rs.2, 00,000 in near by Lingarakata village; relatives took Rs. 150,000 as loan, which never came back to him and he spent rest of the money in merry-making with family, friends and drinking; within 2 to 3years all the money had gone, shared Madhab.

Crops grown by Madhab, before 2003		
Season	Crops	Cultivated area
Rain	Kharif paddy	3 acre
	Ragi	0.5 acre
	Arhar	1 acre
Winter	Biri (blackgram)	1 acre
	Muga (greengram)	1 acre
	Kanda mula (sweetroot)	0.12 acre
Summer	Summer paddy	1 acre

3.3.3. Nandira (tributary of river Bramhani): 'Goddess turned devil'

'Goddess turned devil overnight', people of Bagachara, village close to Nandira observed while tracing the degradation of the river, which was the life line to them about three decades back.

banks of Nandira, Bagachara is a small revenue village comprised of 50 Dalit families including 15 landless, and the rest marginal farm families.

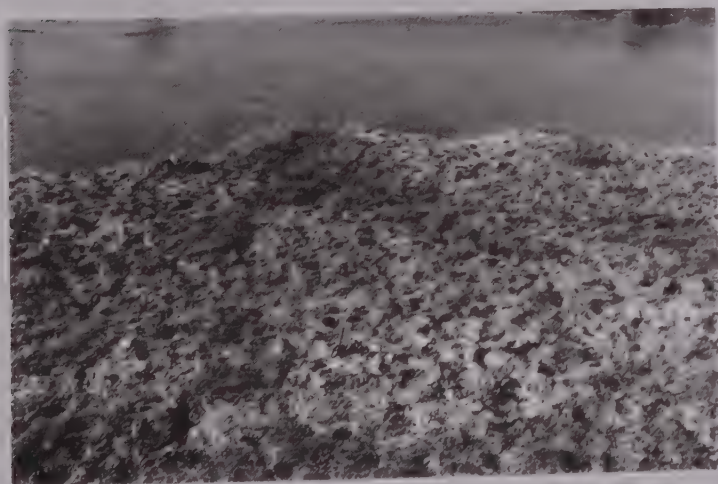
Prior to Nandira turned into a virtual drainage carrying industrial pollution, Bagachara village community used to cultivate varieties of crops round the year using its water for irrigation. Water from Nandira was also used for all domestic purposes including drinking, bathing and livestock feeding.

Pollution of Nandira started in around 1965, when TTPS started discharging its 'ash' to it. Then the Fertiliser Corporation of India (FCI) also released its effluent to it followed by NALCO (releasing untreated effluents, initially), which made the water very polluted. As a result, Bagachara village community discontinued using water for irrigation and other domestic purposes; allegedly, paste attack

increased and crop failed repeatedly, animals as well as humans developed complications when came in contact with the polluted water. Gradually, people abandoned farming practices and shifted to non agricultural wage earning; mostly working in construction, industrial or mining activities.



Nandira river: a virtual industrial drain



'Fly ash' deposit along Nandira, still present following the breach in the NALCO fly ash pond in 2000

3.3.4. Impact on water resources and livelihood: case of few fishing communities along the river Bramhani

Tumungala

- Tumungala, about 3 kilometres downstream of Samal barrage on the banks of river Bramhani has about 110 families, including 20 families belonging to the fishing community. Being landless, fishing in the river Bramhani was the main source of living before the impact of the industrial activities to a large extent influenced fishing.
- Rengali dam, 30-35km upstream Samal barrage on the river Bramhani, was constructed in 1980s; Samal barrage came into existence in 1990's and the National Thermal Power Corporation (NTPC), Kaniha became operational around 1995.
- Prior to the dam and the barrage, the river Bramhani used to have good flow of water from July to November, and there after, up to knee



NTPC, Kaniha releases effluent to the river Tikira, tributary of the river Bramhani

level, till the on set of monsoons. But at present, near the village, the river maintains good flow of water up to 5-6ft even in off rainy season, which makes fishing difficult.

- Earlier, the catch included wide range of fishes, such as, *Rohi*, *Mirkali*, *Bhakur*, *Kala bainsi*, *Ari*, *Balia*, *Kana*, *Seula*, *Chingudi*, *Bijula*, *Kerandi*, *Kantia*, *Bhedi*, *Dengula*, *Andula*, *Ghesara*, *Todi*, *Khandi todi*, *Bacha*, *Jalanga*, etc. during rainy season and up to March-April. Hilsa, available in September - October, to a large extent contributed to bulk of the annual income.
- Prior to the industrial intervention, each fishing family used to enjoy daily catch of 10-15kg of fish (they used to sell fish against paddy).
- Following the industrial intervention in the area - National Thermal Power Corporation (NTPC), National Aluminium Company (NALCO) & Fertilizer Corporation of India (FCI) etc. and release of their waste to the river Bramhani, the fish migration from down streams to up-streams has been decreasing significantly. The diversity has also reduced, only few varieties of less economic importance - *Kalabainsi*, *Seula*, *Gadisa*, *Bijula*, *Kantia*, etc. are available in small quantities, observed the fishermen.
- NTPC, Kaniha discharges one type of oily blackish water (generated from overhauling of its huge boilers at regular intervals), claimed the elders of Tumungala fishing community. Impact is mostly felt during October - June, when water flow is comparatively less. Mass death fish occurs during this period- villagers frequently sight dead floating fishes of *Bijula*, *Jalanga*, *Bhakura*, *Rohi*, *Kana*, *Dengula*, *Andakuria* during this period. Hilsa has completely vanished.
- At present, average fishing family manages to catch 500gm -1kg of fish daily (market rate is Rs 40/kg).
- Under the circumstances, most have changed their main source of earning livelihood, from fishing (rain, winter and greater part of summer) to wage labour (daily wage rate is Rs. 50-55).
- Earlier, women used to go on vending fish and dry-fish, at present they too go for wage earning - construction and agricultural activities (owing to irrigation) have increased and wage is easily available round the year.

Following the industrial intervention in the area (NTPC, NALCO & FCI) and the release of the mining-industrial waste to the river Bramhani, the fish migration from down streams to up-streams has been decreasing significantly. The diversity has also reduced, only few varieties of less economic importance are available in small quantities. At present, average fishing family manages to catch 500gm -1kg of fish daily (market rate is Rs. 40/kg). Under the circumstances, most, including women, have changed their main source of earning livelihood from fishing and related activities to wage labour.

Katarapada

- The fishermen of Katarapada (20 families), a village just above Samal barrage also claimed to have observed mass fish death as well as significant decrease in the volume of catch following the operation of NTPC, Kaniha. Earlier they used to get catch of 10-15kg daily which has reduced to 1-2kg. Earlier, they used to work as labourers in rainy season and catch fish in winter and summer, but now mainly depend on wage round the year.

Jhadiamba

- Village Jhadiamba, on the banks of the river Brahmani, (on the opposite bank is the village Dasanali with the 'ash ponds') is about 50 kms from NTPC, Kaniha (on river) includes 15 families belonging to the fishing community. Prior to the Samal barrage and operation of NTPC (about 9-10years ago),



The effluents from NTPC, Kaniha eventually drains to the river Bramhani

they used to catch about 4-5kg fish daily, which has reduced to 1-2kg at present. While there is about 75% reduction in *Chingudi and Balia*, fishes like *Ali, Kana* have almost disappeared, observed the elders.

The 'coal' fact

Coal is the most important and abundant fossil fuel in India. It accounts for 63% of the country's energy need. India now ranks 3rd among the coal producing countries. Most of the coal production in India comes from open pit mines contributing over 80% of the total production. About 247.85 billion tonnes of coal reserves are estimated by the GSI (as on 1.1.2005), out of which Orissa accounts for 60.98 billion tonnes (24.60%). This is next to Jharkhand, which accounts for 72.20 billion tonnes (29.13%) of total coal reserve. The major coal mines are located in Talcher and Ib valley in Orissa. Although coal plays an important role in catering to energy needs, it also causes environmental damage during mining, transportation and processing. Out of the total twenty six coalmines in Orissa, 12 are open cast and 14 are underground - 18482.857 hectares is covered by coal mining activities in Orissa. The coalfields in Orissa occupy 7.6% of the area (2723 Sq. Km). Talcher coalfield accounts for 12 coal mines and 44.57 MT of coal was produced in 2004 - 05. The Ib valley coalfields has 14 coalmines and 21.51 MT of coal was produced in the year 2004 - 05.

Coal production in India has increased from 30 million tonnes in 1940 to 416 million tonnes in 2001-02 and it is expected to reach 700 million tonnes during 2009-2010. Average annual production growth rate during 1980 was about 6.5%. Bulk of the electricity generated (about 65.7%) is from thermal power stations, which depend upon coal as feedstock. In addition, other industries like steel, cement, fertilizers, chemicals, paper and thousands of medium and small-scale industries are dependent on coal for their process and energy requirement. Orissa is ideal for thermal power projects. Large coal reserves in Talcher-Ib Valley coal fields of Mahanadi Coalfields Ltd. and abundance of water in Hirakud and Rengali reservoirs in close proximity of these coal mines make these locations perhaps the 'best sites' for pithead power plants in the country. The State power sector consumes about 23 million tonnes of coal per annum for power generation.

(Coal Mines and Related activities Versus Environment in Orissa, Envis news letter August - October, 05, Vol2, Centre for Environmental Studies, Forest and Environment Department, Govt. of Orissa)



'Destruction - scape' of the area once rich with life giving resources : coal overburdens (L) and 'ash ponds' (R)

3.4. Technical observation

About four decades ago, when the waters of the river Bramhani was free from industrial effluents, fishing was one of the major sources of the livelihood for the fishing communities living along it. But no more, thanks to the mindless release of the industrial effluents into it, which has played havoc to the fish population, diversity as well as the livelihood of those who depended on it. The impact on water, soil, plant growth and agricultural production in the immediate surrounding, even the regions located distantly is no more matter of academic speculation, it is the felt truth. The following is the observation of the technical team who followed the community perceptions.

Bramhani pollution and river-fishing scenario (observation at Tumungala and neighbouring villages)

- Out of 41 species mentioned by the community, 12 species are not available presently due to lack of coping mechanism to the pollution; the rest 29 species are available but in significantly decreased quantity.
- Communities of Tumungala and Dasnali, 3 kilometers and 50 kilometers below the Samal Barrage respectively, reported fish death at regular intervals. They relate it to the release of oily substance after overhauling of Boilers at NTPC, NALCO and TTPS. This is possible, as the oily substance could choke the gill and decrease the oxygen level in water, resulting in mass death.
- As per Mayer et al. (1992) exposure of fish to heavy metals may result in variable degrees of ion regulatory disruption. Heavy metals also affect the spawning potentials of the freshwater species. Pb (lead) should not be more than 0.01mg/l in water for the aquatic sensitive zones (Central Pollution Control Board). Presently, the lead value found to be more than 0.01Mg/l even in rainy season - which would be at higher level in peak summer days. Since the samples were collected during rainy season, much of the heavy metal content might have leached or diluted. Heavy metal pollution decreases the reproductive capacity of the fish species, which could be one of reasons of decline in fish catch, as claimed by the fishing communities (water test report in Annexure-II).

- The pollution could be one of the reasons for significant decline in migration of economically important Hilsa fish, as it is anadromous (migrates from sea to fresh water to spawn/breed) in nature and very sensitive to water pollution.
- Cadmium (Cd) found to be within permissible limit (water sample tested at the Regional Research Laboratory, Bhubaneswar, presently Institute of Metal and Mineral Testing), but when it gets into the food chain system there is danger of getting accumulated in the human body. The increase in concentration of Cd may create genetic deformities in humans and animals.

Presently, the lead value found to be more than 0.01Mg/l even in rainy season - which would be at higher level in peak summer days. Heavy metal pollution decreases the reproductive capacity of the fish species, which could be one of reasons of decline in fish catch. Cadmium (Cd) found to be within permissible limit, but when it gets into the food chain system there is danger of getting accumulated in the human body. The increase in concentration of Cd may create genetic deformities in humans and animals.

Drinking water scenario: Fluoride contamination

Water sample tested from the drinking water sources of BalugaonKhamar and Dasanali found to have fluoride contamination. The fluoride content varies from 1.5 mg/l to 3 mg/l (though samples tested in early rainy season), which is more than the permissible limit i.e. (1.0 mg/l), and

toxic to animals and various ailments like digestive system, pain vomiting, frequent body, etc. There are

Water sample tested from the drinking water sources of BalugaonKhamar and Dasanali found to have fluoride contamination.

humans - may cause weakening of the in the limbs, headache, urination, rashes on the other long-term

consequences as well. Fluoride affects the chromosome, which in turn affects the gene framework leading to disastrous consequences like deformity of the human stature. Excess fluoride contamination causes dental and skeletal fluorosis. Dental fluorosis is usually the first consequence of the consumption of excess fluoride. It makes the teeth weak, brittle, yellow and the gums grey. Skeletal fluorosis is the next and more dangerous stage, in which the bones bend and weaken leading to premature ageing of the affected person.

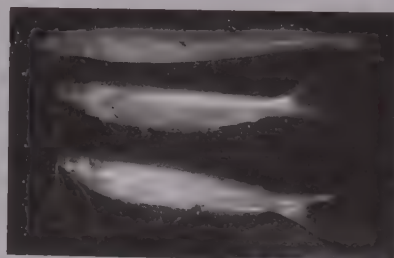
The water withdrawal and waste water generation by the major industrial users in Angul-Talcher region

(figures in 10 ³ litres/day)			
Sr.	Industrial Unit	Water withdrawal	Wastewater generation
01	NALCO		
	Captive Power Plant	143000	90000
	Smelter Plant	5650	4250
02	Fertilizer Corporation of India	64800	23200
03	Talcher Super Thermal Power Project		
	NTPC Kaniha	115200	47000
	TTPS Talcher	39000	18700

Source:Country Policy Support Program (CPSP), Indian National Consultation 21-22 Nov.2003, New Delhi, International Commission on Irrigation & Drainage (ICID), New Delhi.

Fish diversity in the river Bramhani at Tumungala, as shared by the fishing community

1. Cherpatia: Gadusia chapra
2. Ali : Mystes singhala
3. Bijula: Rita Sps
4. Balikira, Baligirada: Glosogobius sps
5. Toddi: half beak, Xenontodon Cancila
6. Suleri: Ailia coila
7. Chintala: Osteobrama cotio
8. Baunsa patria: stelophorus sps
9. Balia: Wallgo attu
10. Fali: Notopterus notopterus
11. Chitala: N. chitala
12. Singhi: Hoteropneustus fosilis
13. Seula: Chhana marulius
14. Rohu: Labeo rohita
15. Catla: Catla Catla
16. Mirikali: C. mrigala
17. Kalabainshi: L. calbasu
18. Serena: P. sarana
19. Pohala: L. bata
20. Chingudi: M. rosenborgiie



Tori and Suleri



Glass fish

21. Gania:
22. Chenga: Channa punctatus
23. gadisa : Chana striatus
24. pati, glass fish: Chanda sps
25. Kani
26. Kusuli
27. Tori: Mystesymbalus
28. Khanda Tori:
29. Kerandi: Puntius sps
30. Bachha
31. Jalanga
32. Kantia
33. Dengula
34. Endula
35. Ghesara
36. Gola
37. Bhandari khuria
38. Kataranga
39. Kathua
40. Gentu
41. Dandakiri

Bruised Bramhani and Scarred Angul-Talcher region Mining /industries in Bramhani river basin

The Brahmani basin is rich in water resources and the per capita availability of fluvial fresh water in rivers and ground is at around 3077 m³/year. The basin is rich in minerals and in forests as well, which occupy 37% of the basin area. Starting with setting up of a one million tons capacity steel plant at Rourkela in 1950s, there has been a large-scale industrialization with Sundergarh, Angul and Dhenkanal having a major share of industries in the basin with dominance of coal, metallurgical and chemical units.

Near the Brahmani-Baitarani delta, are located the Bhitarkanika National Park and Wild life sanctuary lying in the mangroves ecosystem. About 215 sq. km. of these mangroves has been listed as a RAMSAR SITE in November 2002. There has been a significant reduction in the mangroves area, but this seems to be due to occupation of the land by migrant population. However, the estuarine water quality and its effects on mangroves needs further studies.

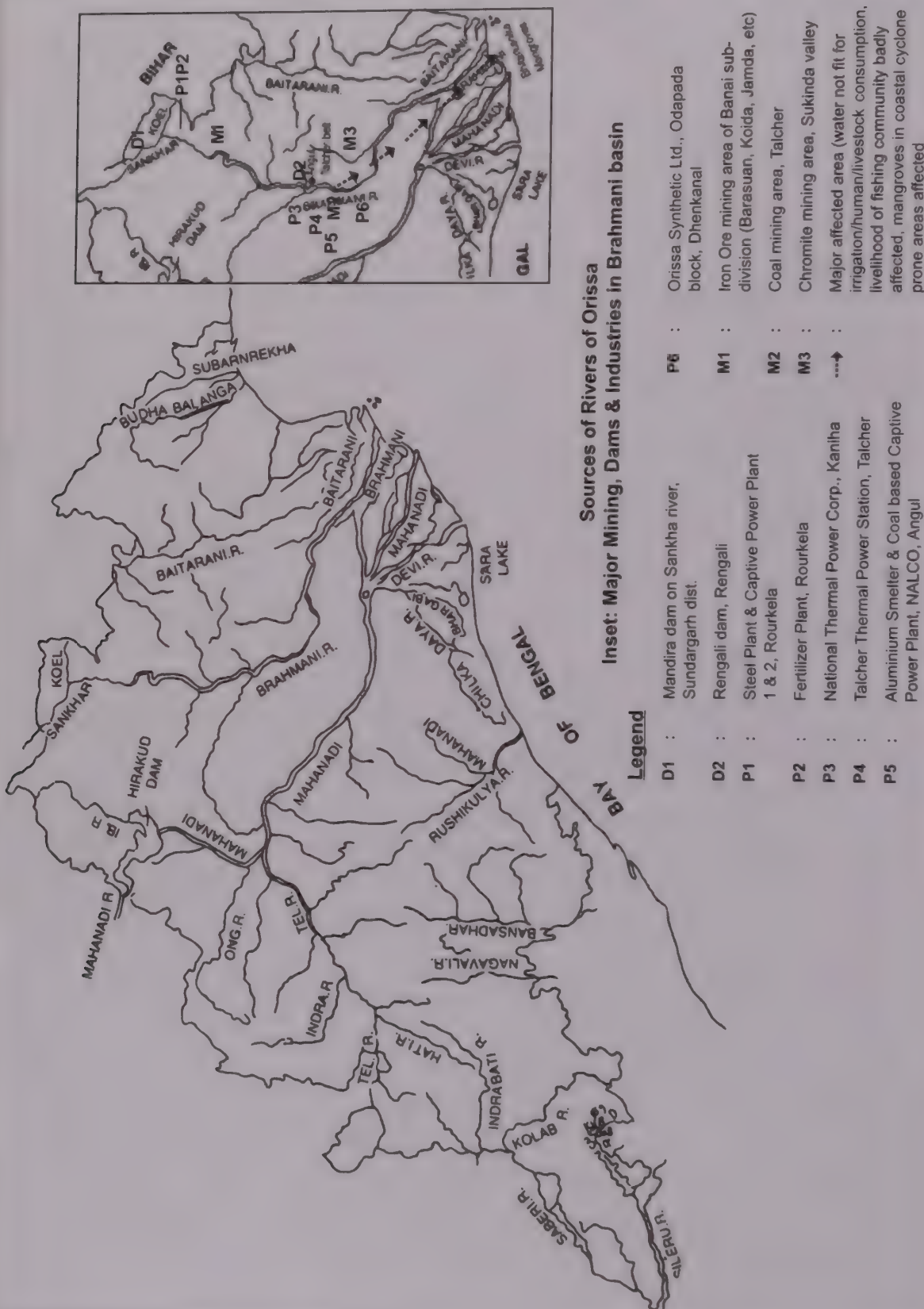
Angul-Talcher area lies between 20° 37' N to 21°-10' N Latitude and 84° 53' E to 85° 28' E Longitude. The area receives 1350mm of average annual rainfall and is drought prone. Maximum source temperature of 50.9° C has been recorded. The entire area is dissected by river Brahmani into two halves, while it traverses from north-west to south-east and drains directly into the Bay of Bengal. Water of Brahmani and its tributaries cater to the industrial/domestic need of this fast growing complex. The major part of the area forms the plains of river Brahmani and its tributaries like Nandira Jhor, Singada Jhor and Tikira river. The drainage network is controlled by river Brahmani. A rivulet Nandira, which flows centrally from west to east and meets Brahmani near the village Kamalanga. It is highly polluted carrying almost all the industrial effluents and also a sizeable load of domestic effluent from industrial townships, located on either sides of the river. Banguru Nallah originates from Satyabadi Sagar situated within the lease hold area of Kalinga Open Cast mine project carries the waste water of different coal mines of MCL and joins Brahmani from North-West. Deojhar nallah flowing to Nandira rivulet carries the run offs of mining area as well as waster water of South Balanda colliery. Samal barrage on Brahmani river is a major Irrigation Project planned to command 2,20,000 ha.

Angul-Talcher region with 1813 sq.km of coal bearing area is one of the major industrial zones in the State of Orissa and in the country. The area is fast emerging as a large source of coal, aluminium mining and thermal power in the country. About 711 sq.km area forms the core industrial zone. The total reserve of coal in this area has been estimated to be 36870 million-tons against India's reserve of 240750 Million tonnes. Out of the total reserve, 2548.5 million tonne is superior grade coal (Grade A,B,C and D) and rest 22936.68 million tonne is power grade coal. The availability of coal in Talcher area and water of river Brahmani are responsible for growth of industrial activities. On the average 36MT of coal is being extracted annually. Raw water to the extent of about 86.26 Mcum/annum is drawn from the river for industry/mining activity (apart from other surface & ground drawals). The industrial activities in Angul-Talcher area is primarily dominated by large scale coal based Super Thermal Power Plants & Industrial production units.

Mahanadi Coalfields with 6 Open Cast mines and 4 underground mines has been operational using water from Brahmani & its tributaries like Tikra, Banguru Nallah and substantially from ground water. The wastewater on which reliable quantitative information is not available is discharged into the streams after settlement in low lying areas, which overflows to paddy fields en route to drainage channels.

Source: Country Policy Support Program (CPSP), International Commission on Irrigation & Drainage (ICID), New Delhi (2003).

The river Bramhani, with a catchments area of 39,000 square km and a length of 701 km is the second largest river of Orissa. As a result of largescale mining operations, it is also one of the most polluted rivers in the State and one of the ten most polluted rivers in the country: Ecological Debt, a case of Orissa, India, 2006



Agriculture scenario

- Chromium (Cr) present in the soil would reduce the soil moisture content (necessary for the soil fertility and plant growth) and adversely affect the plant growth. The study also investigated the effects of Cadmium (Cd) on the growth of paddy and other crops in the sample villages. More than 0.1 mg/liter of Cadmium concentration causes a delay in seed germination as well as growth. The Cadmium contamination in soil during the summer days or at early rainy days (when paddy seedlings are raised) at concentrations ranging more than the 10 mg/kg can cause severe damage to rice plant. Height of Paddy plants is reported to be reduced by 30 % and the number of tillers and the rice yield declined by 30-40 %, compared to the other outer periphery of this industrial belt. Ref: Patra S.N.; Mayer et al. (2002 & 1992).
- Concentration of Pb (lead) in the soil minimizes the germination rate of seed and the shoot growth. The agricultural land in mining and 'ash pond' region found to be polluted with lead - the samples tested revealed high concentration of lead in soil. This affects the germination and shoot growth resulting in decreased production (could be one of the factors behind farmers in the villages losing interest in agricultural operation).
- In the sample villages, the temperature during peak summer rises to more than 50⁰ C and has already affected the cropping pattern - the quick loss of moisture does not allow the farmers to go for the second crop; the farmers used to grow vegetables in summer no more do that as it requires frequent irrigation and significantly reduces the harvesting duration rendering the



NTPC Kaniha (L), about eight meter high ash pond - leaching inevitable (R)

operation quite unprofitable. The consistent rise in temperature would affect the soil moisture content, the soil fertility as well as the crop yield in the region impacted due to the industry and mining induced temperature rise. The increased atmospheric temperature would also adversely affect the plant diversity as well as the natural regeneration cycle.

- Surface and ground water quality is also affected by the runoff or leaching of toxic elements from 'ash ponds', residues from overburdens. The residual deposit on the soil surface affect the soil nutrient status and the pollutants infiltrate and percolate to 3 to 4 meters below ground level. The reasons for the contamination of soil profile include: increase in surface area of the 'fly-ash-pond' with increase in spread of the 'fly ash' dust and leaching. The leaching of water from the overburdens is expected to infiltrate and percolate into the ground water table by horizontal and vertical flow of contaminants.

Chromium (Cr) present in the soil would reduce the soil moisture content and adversely affect the plant growth. More than 0.1 mg/litre of Cadmium concentration causes a delay in seed germination as well as growth. Height of Paddy plants is reported to be reduced by 30 % and the number of tillers and the rice yield declined by 30-40 %.

Concentration of Pb (lead) in the soil minimizes the germination rate of seed and the shoot growth. The agricultural land in mining and 'ash pond' region found to have high concentration of lead in soil.

The temperature during peak summer rises to more than 50⁰ C and has already affected the cropping pattern - the quick loss of moisture does not allow the farmers to go for the second crop, vegetables in summer requires frequent irrigation and significantly reduces the harvesting duration rendering the operation quite unprofitable.

'Fly ash' deposit over the agriculture fields is already adversely affecting production and would be be further aggravated - plants are affected due to the closure of stomata pores and lessening of photosynthesis process.

Wind based deflation of pollutant material such as fly ash, material from the overburdens in collieries are flown to several kilometers based on the velocity of the wind flow affects the soil profile.

These contaminants enriched water and the deposited pollutants in the agricultural fields would drastically affect the yield rate.

'Fly ash' deposit over the agricultural fields is already adversely affecting production and would be further aggravated - plants are affected due to the closure of stomata pores. The plants get dried off due to lessening of photosynthesis process.

The 'fly ash' discharged through chimney and the 'ash slurry' in ponds are causing serious hazards to the ecosystem. Wind based deflation of pollutant material such as 'fly ash', material from the overburdens in collieries are flown to several kilometers, based on the velocity of the wind flow, affects the soil profile even at areas located more than 10 kilometers away.

Fly Ash Scenario in India

According to the Central Electricity Authority of India, there are around 83 major coal fired thermal power plants and 305 hydro plants existing in India. The total installed generating capacity (Thermal + wind) during 2003-2004 was about 79838 MW and hydropower generation was 29500 MW. In addition to this, there are more than 1800 selected industrial units which had captive thermal power plants of >1MW. According to National Thermal Power Corporation (NTPC), coal is used for approximately 62.3% of electric power generation in India, oil and gas accounts for 10.2%, hydro's share is 24.1%, nuclear, wind, and other contribute remaining 3.4%.

India at present produces around 120 Million Tonnes of Ash per annum. The power requirements of the country are rapidly increasing with increase in growth of the industrial sectors. India depends on Thermal power as its main source (around 80% of power produced is thermal power), as a result, the quantity of 'Ash' produced shall also increase. Indian coal on an average has 35 % Ash and this is one of the prime factors which shall lead to increased Ash production and hence, Ash utilization problems for the country. Out of the total Ash produced, 'Fly ash' contributes to a small percentage, majority being 'pond ash' and 'bottom ash'.

Present Fly-ash Scenario

'Fly ash' is a fine, glass powder recovered from the gases of burning coal during the production of electricity. These micron-sized earth elements consist primarily of silica, alumina and iron.

- Over 75% of the total installed power generation is coal-based
- 230 - 250 million MT coal is being used every year
- High ash contents varying from 30 to 50%
- More than 110 million MT of ash generated every year
- Ash generation likely to reach 170 million MT by 2010
- Presently 65,000 acres of land occupied by 'ash ponds'
- Presently as per the Ministry of Environment & Forest figures, 30% of Ash is being used in fillings, embankments, construction, block & tiles, etc.

(Source: Fly ash status summary report in India, Natural Resources, Canada)

3.5. Legal aspect

The present study on impact of mining and industrialisation on food security, livelihood and natural resources has multiple dimensions. But from the legal perspective two issues are analysed: the land acquisition process for industrialisation and the alienation of land in favour of state by individuals in lieu of monetary compensation, and compensating the damages caused by the mining and industrialisation process.

The encroachment on private property, and also on the livelihood of people by the State during the last fifty years has happened due to massive acquisition of private and common property in the name of 'public purpose'. After the amendment in 1984, even the requirement to bother about 'public purpose' was done away with, and the State got a clean chit to acquire land, even for the companies. The anomalous situation created by the Land Acquisition Act could have been corrected and the fraud on the Constitution could have been stopped had the courts taken an initiative and a positive stand for the protection of the rights of the people directly affected by the said acquisition process. Despite their activist role in so many fronts, especially in giving expansive interpretation to rights, this is one area courts have wavered and refrained to look into, and the congruity or incongruity of the Land Acquisition Act vis-à-vis the constitution and the limit of public purpose have remained unchartered yet.

On a cursory look of the Land Acquisition Act, one derives an impression that the Act offers full freedom to the State to decide as to the necessity of acquiring a land for public purpose, or for the company. People are often given an understanding that the power to acquire a piece of land is a matter of subjective satisfaction of the State. The traditional concept of 'eminent domain' and the concept of 'police power' give a backing to the State to acquire any amount of land that is required. But it is a fallacious notion, because the concept of 'eminent domain' is an American concept, which regards 'power to acquire' as an inherent power of the State. But the point is, under the controlling constitution, where

The law makes a distinction between people owning land and the landless folks by using the term 'persons interested in land' and limiting the scope of law to provide compensation to them only. With respect to compensation, the law does not lay down the basis for the determination of market value.

The idea that current generation has obligation to restrict its use of the environment in order to preserve it for future generation has emerged as a norm in environmental policy making. One manifestation of how duties of future generation have influenced environmental policy is the way inter-generational equity fits into the main definition of sustainable development. Under the constitution, citizens have a right to a liveable environment and this right needs to be preserved at the expense of limiting people's freedom to degrade environment. The notion that each person has a fundamental and inalienable right to health as well clean environment has a strong background support basing upon the social need and the legal mandate.

every power that is exercisable originates from the constitution, how can such a power be regarded as so inherent to fall outside the constitutional framework, and be vested in the State is difficult to understand.

Once the decision to acquire the land is taken and the declaration is made, it is the conclusive evidence that the land is needed. After this, the only option available to the affected person is to claim for compensation. Here again, the law makes a distinction between people owning land and the landless folks by using the term 'persons interested in land' and limiting the scope of law to provide compensation to them only. With respect to compensation, the law does not lay down the basis for the determination of market value. As for determining the compensation, market value at the time of the publication of the first notification is generally taken into view; the value so determined comes out to be nothing but a historical value. The catch does not end here. The law further declares that the award given by the district Collector is final and conclusive evidence of true area, value of land, etc. Though it is always being reviewed by the courts, as all the people cannot afford to go to the court, the Act virtually keeps the displaced persons and projected affected people at the mercy of the Collector. Another very draconian aspect of the Act is that after making the award, the Collector can take possession of land, and the land absolutely vests in the Government free from any encumbrances. The law does not prevent the Collector from taking possession of land till the compensation is paid to the person having interest in land. The only duty cast on the Government is that if, by the time possession is taken, compensation has not been paid to such persons, an interest has to be paid at the rate of nine percent per annum for one year for taking possession, and at the rate of fifteen percent after that.

Economists view environmental resources as forms of natural capital that provide four categories of services: material input, waste receptor services, life support function and amenities services. A river provides an example in this concept, how a single environmental resource can yield multiple services. It may support life by serving as source of drinking water. It may also provide amenities services in the form of various facilities for village people. This river may also be the source of material input by producing fish, which are harvested. It may serve as a receptor of waste water. It is necessary to consider not only the services provided this year but also that may be provided in future years. The idea that current generation has obligation to restrict its use of the environment in order to preserve it for future generation has emerged as a norm in environmental policy making.

One manifestation of how duties of future generation have influenced environmental policy is the way inter-generational equity fits into the main definition of sustainable development. Under the constitution, citizens have a right to a liveable environment and this right needs to be preserved at the expense of limiting people's freedom to degrade environment. The notion that each person has a fundamental and inalienable right to health as well clean environment has a strong back ground support basing upon the social need and the legal mandate.

It is pertinent to ponder whether the compensation provided against the piece of land acquired by the Government at the current market rate actually compensates the loss suffered by alienation?



Natural water channels at present carry mines waste- Bangaru-nala partly appropriated by the coal mining

The question that is being posed primarily whether the existing legal regime is sufficient enough to address these issues or concerns of people on the basis of equity and rights? How the benefits/losses of the ecological resources or environmental changes can be defined and linked and how can these benefits/losses be measured in practice? How the courts of law have addressed or failed to do so in case of these forceful propositions of environmental torts. For example, in case of the river Brahmani, fishing was a major source of livelihood for many traditional fisher-folk families in terms of their food security but due to the water pollution contributed by the Steel and Fertilizer Plants, Thermal Power Plants, Aluminium Smelter Plants, Captive Power Plants, and the mines in its basin, the fish production has gone down exponentially.

The questions that arise are how will one be able to prove before the legal forum that the waste water generated by the mines and industries have contributed to the reduction in the fish growth? How does one account for the degradation of ecological resources? What valuation procedure can be adopted by court for compensating the fisher-folks for the damage caused to their source of living by the mines and industries? Whether the people have any choice of making a decision to accept the pollution caused by the mines and industries in the name of development?

Considering the issue of land acquisition and requisition, the primary focus points seem to be the loss of perennial agricultural land in exchange of a specified market cost, and the ecological as well the overall impact of the loss of land and the process of industrialisation as well. The money paid as compensation lasts the family for a few years, whereas the crops grown over the land provides a certain sustainable livelihood to the whole family for the whole year, spread over multiple generations. Apart from it, when a particular piece of land is acquired and an industry is developed over the same, the pollutions caused by the same not only impacts the locality but also the whole area. Random industrialisation in the name of development and subsequent acquisitions have not only rendered a vast part of population landless but also impacted negatively the residual landed properties which lose their moisture and the fertility and multiple productions

Whether the losses suffered by the community through alienation of common property as well as loss of the forest land and contamination of the environment including the breathing air and water bodies could ever be quantified and compensated by payment of the alleged market value of the land acquired?

When there are threats of serious and irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

potential. The common resources of the villages are acquired, the water bodies get contaminated along with the overall environment, which in turn imbalance the ecology and create a dent in the overall lifestyle of the local population irrevocably.

In this regard, it is pertinent to ponder whether the compensation provided against the piece of land acquired by the Government at the current market rate actually compensates the loss suffered by alienation? Can the amount of money paid as onetime compensation be compared with the multifarious intergenerational benefits reaped from the landed property? Whether the losses suffered by the community through alienation of common property as well loss of the forest land and contamination of the environment including the breathing air and water bodies could ever be quantified and compensated by payment of the alleged market value of the land acquired?

In this aspect the judge-made laws and the import of the international environmental principles are worth noting. The Apex Court of the country, in *Vellore Citizens' Welfare Forum v Union of India* has necessarily held 'The precautionary principle' and 'the polluter pays' principle to be the essential features of 'Sustainable Development'. The 'precautionary principle' - in the context of the municipal law - means: (i) Environmental measures to be taken by the State Government and the statutory authorities that must anticipate, prevent and attack the causes of environmental degradation. (ii) When there are threats of serious and irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation (iii) The 'Onus of proof' is on the actor or the developer/industrialist to show that his action is environmentally benign. 'The polluter pays' principle has been held to be a sound principle also by the Supreme Court in *Indian Council for Enviro-Legal Action v Union of India* (The Bichhri Case) wherein the court observed, 'we are of the opinion that any principle evolved in this behalf should be simple, practical and suited to the conditions obtaining in this country'. The court ruled that 'Once the activity

The 'polluter pays' principle as interpreted by the Supreme court means that the absolute liability for harm to the environment extends not only to compensate the victims of pollution but also the cost of restoring the environmental degradation. Remedying the damaged environment is part of process of 'Sustainable Development' and as such the polluter is liable to pay the cost to the individual who suffers as well as the cost of reversing the damaged ecology.

It is an affirmation of the duty of the State to protect the people's common heritage of streams, lakes, marshlands and tidelands, surrendering that right of protection only in rare cases when the abandonment of that right is consistent with the purposes of the trust. The State has an affirmative duty to take the public trust into account in the planning and allocation of water resources, and to protect public trust whenever feasible.

carried on is hazardous or inherently dangerous, the person carrying on such activity irrespective of the fact whether he took reasonable care while carrying on his activity'. The rule is premised upon the very nature of the activity carried on. Consequently, the polluting industries are 'Absolutely liable to compensate for the harm caused by them to villagers in the affected area, to the soil and to the underground water and hence, they are bound to take all necessary measures to remove sludge and other pollutants lying in the affected areas'. The 'polluter pays' principle as interpreted by the Supreme court means that the absolute liability for harm to the environment extends not only to compensate the victims of pollution but also the cost of restoring the environmental degradation. Remedying the damaged environment is part of process of 'Sustainable Development' and as such the polluter is liable to pay the cost to the individual who suffers as well as the cost of reversing the damaged ecology.

Similarly, another important environmental principle is the Public Trust Doctrine that primarily rests on the principle that certain resources like air, sea, waters and the forests have such a great importance to the people as a whole that it would be wholly unjustified to make them a subject of private ownership. The said resources being a gift of nature, should be made freely available to everyone irrespective of the status in life. The doctrine enjoins upon the Government to protect the resources for the enjoyment of the general public rather than to permit their use for private ownership, or commercial purposes. The Public Trust Doctrine imposes the following three types of restrictions on government authority: First, the property subject to the trust must not only be used for a public purpose, but it must be held available for use by the general public; second, the property may not be sold, even for a fair cash equivalent; and third, the property must be maintained for particular types of uses. Thus, the public trust is more than an affirmation of State power to use public property for public purpose. It is an affirmation of the duty of the State to protect the people's common heritage of streams, lakes, marshlands and tidelands, surrendering that right of protection only in rare cases when the abandonment of that right is consistent with the purposes of the trust. The State has an affirmative duty to

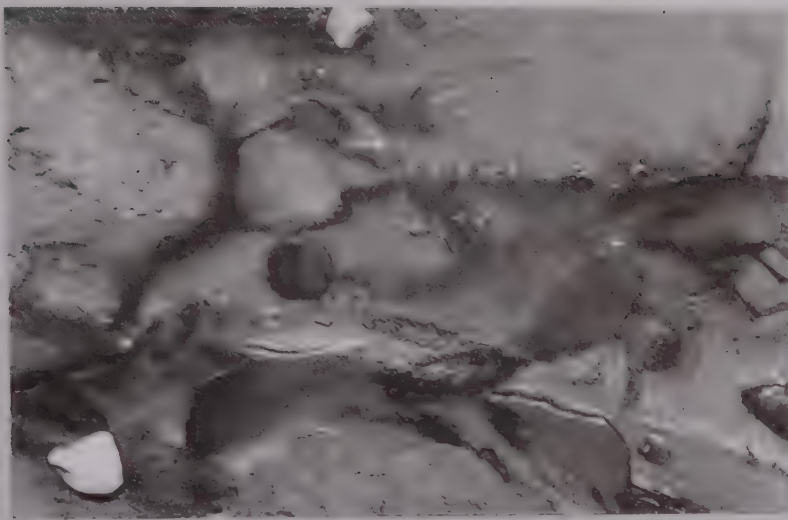
take the public trust into account in the planning and allocation of water resources, and to protect public trust whenever feasible. Just as the history of this State shows that appropriation may be necessary for efficient use of water despite unavoidable harm to public trust values, it demonstrates that an appropriative water rights system administered without consideration of the public trust may cause unnecessary and unjustified harm to trust interest.

In the context, Common Property Resources (CPR) can be defined as those resources in which a group of people have coequal use rights. Membership in the group of co-owners is determined by membership in some other group, e.g. village, tribe, etc. Resources which are usually characterised as Common Property Resources are grazing lands, village ponds, common forests and so on. These lands may quite often not belong to the community in any legal but merely de facto sense. The significance of CPR lies in their income generation capacity. They sustain the rural poor and provide employment to those in search of productive work. The community on the other hand develops a sense of attachment to the resource, which produces social sanctions on its use, creating thereby conditions for its regeneration.

The seminal importance of CPR in the socio-cultural and economic life of the local communities notwithstanding, the myopic policies of the State, have all but destroyed the concept. There is today no explicit recognition of CPR right or a protection for its users. However, such a right is discernible from a holistic reading of the Indian Constitution coupled with International perspectives.

In so far as the Indian legal framework is considered, it is a question of great regret that though the judge-made laws have tried to import and implement many principles constituted of heavily loaded terminology, still the laws of the land have failed to formulate suitable legislative paraphernalia for proper codification and execution of those principles. The Public Trust Doctrine vis-à-vis the socio-

The lack of any accounting process to properly quantify the damages to the ecology whose impact can be felt and spread over several generations also contributes to the ineffectiveness of the said principles despite the much hyped inclination of the courts of the country to implement the same. How far the activities of mining and industrialisation, as abetted and acquiesced by the Government in the name of development, are sustainable that damages the ecology in a slow, steady and irrevocable manner, leaving only a worthless and poisonous shell in the name of environment to our future descendants in terms of legacy is a question that needs special attention of all the socially and environmentally conscious intellectuals.



Deposition oily and black substances on Bramhani river bed

cultural importance of the CPR, the precautionary principle and the polluter pays principle though at first glance seem very important and context wise worthy principles, still due to the lack of proper implementing authority framework as well legal import in terms of codification, they are

virtually ineffective yet. Moreover, the lack of any accounting process to properly quantify the damages to the ecology whose impact can be felt and spread over several generations also contributes to the ineffectiveness of the said principles despite the much hyped inclination of the courts of the country to implement the same. How far the activities of mining and industrialisation, as abetted and acquiesced by the Government in the name of development are sustainable that damages the ecology in a slow, steady and irrevocable manner, leaving only a worthless and poisonous shell in the name of environment to our future descendants in terms of legacy is a question that needs special attention of all the socially and environmentally conscious intellectuals.

If we visualize the problems and issues of concern revealed by the current study in the light of the above principles and mandates, we find that environmental accounting is as important as the environmental accountability and the monetary valuation of natural resources is at the heart of integrated accounting. Although this might amount to putting a price on the priceless, without such valuation, comparison of different economic and environmental activities, processes and their interaction is not possible. Introducing a monetary value on resources would facilitate controlling the use of such resources. This is where the Government can intervene in the market to promote environmental protection. Traditionally, economists tend to view a competitive or free market as the preferred means of allocating scarce resources in an efficient manner. The market mechanism functions correctly, however, only if prices fully reflect the costs and benefits of production to the entire society. Pollution is a common 'externality' to the market system that disturbs it. There is also the related problem of collective goods, which are commodities that cannot readily be supplied to specific persons without enabling large number of other persons to enjoy them too, such as benefits of effluent



Water from NTPC 'ash ponds',
Kaniha rushes to eventually meet the river Bramhani

treatment equipment. Because of the free markets' failure to provide adequate incentives, the Government must intervene to limit external costs and to facilitate production of collective goods. There are four basic approaches: Recognition of property rights with damages and injunctive remedies being

available to injured owners; Direct regulation (e.g., emission limitations); Subsidies (i.e., Government payment of some of the expenses of avoiding external costs or producing collective goods), and Charges for activities generating external costs or failing to provide collective goods.

The law until now has concentrated its efforts on questions of the prohibition and regulation of environmental pollution in a context essentially removed from the market. The legal regime has been characterised by the inadequacy of the regulatory mechanisms, of high cost and of the dependence on budgetary supplements from Governments.

The legal regime has been characterised by the inadequacy of the regulatory mechanisms, of high cost and of the dependence on budgetary supplements from Governments. The role of economic instruments in supplementing the regulatory approach to environmental protection has only been recently rediscovered. The laws' failure also lies in its incomprehension of the fact that factors affecting sustainable development transcend mere issues of pollution control.



Uncertain future of fisherfolk along the river Bramhani who were never beneficiary of any 'compensation package'.

The role of economic instruments in supplementing the regulatory approach to environmental protection has only recently rediscovered. The laws' failure also lies in its incomprehension of the fact that factors affecting sustainable development transcend mere issues of pollution control. Even the concepts of Corporate Social Responsibility and Corporate Environmental Responsibility are required to be considered in this regard independently as well vis-à-vis each other.

Environmental protection has been considered to be "in the public interest" and external to private life. Governments have assumed principal responsibility for assuring environmental management, and have focused on creating and preserving a safe environment. When environmental problems have arisen, the public sector



Increased incidence of respiratory disease :
(Dasnali village)

has generally borne the responsibility for mitigation of environmental damage. In this approach, some have contended that unrestricted private sector behaviour has been considered as presenting the "environmental problem". However, the roles of sectors have been changing, with the private sector becoming an active partner in the environment protection. Many government and business houses are now realizing that environmental protection and economic growth are not always in conflict. Globally, the concept of corporate social responsibility is moving from a fringe consideration to a core business issue and a permanent part of

business management. Corporations are beginning to respond to expectations of corporate responsibility by asking what is good for the environment, society and business, as well as how their performance can be measured and evaluated.

If we visualize the problems and issues of concern revealed by the current study in the light of the above principles and mandates, we find that environmental accounting is as important as the environmental accountability and the monetary valuation of natural resources is at the heart of integrated accounting. Although this might amount to putting a price on the priceless, without such valuation, comparison of different economic and environmental activities, processes and their interaction is not possible.

Annexure-I

Soil Sample test: Six samples were tested at Orissa University of Agriculture and Technology (OUAT); Bhubaneswar by Dr. D. Jena and team.

Sample No	Cadimium (Cd) (ppm)	Zinc (Zn) (ppm)	Lead (Pb) (ppm)	Cromium (Cr) (ppm)	Remarks
1	0.030	4.140	0.792	0.266	Sample ref:
2	0.054	0.458	0.834	0.124	(1/2) Outer periphery to NALCO 'ash pond'
3	0.026	1.044	2.418	0.230	(3) NTPC 'ash pond'
4	0.072	0.274	Nil	0.224	(4) Crop field near to NTPC 'ash pond'
5	0.056	0.426	0.113	0.076	(5) 'Ash pond' outer periphery
6	0.048	1.312	0.051	0.114	(6) Paddy field near to overburden

Annexure-II

Water Sample test: water sample tested at the Regional Research Laboratory/ Institute of Metal and Mineral Testing, Bhubaneswar by Dr. Acharya and Dr. J. Muralidhar team (Sample -1: NTPC, Kaniha river point and Sample-2: Singada-nala).

Elements:	Sample-1 Mg/l	Samples-2 Mg/l
Cd	0.01	0.01
Pb	0.01	0.01
Zn	0.015	0.015
Cr	0.01	0.01
CN	0.05	0.05
F	0.1	0.2



'Abandoned' village : Lingaraj coal mines area

Annex.3. Excerpts from the TOR for the Micro- study

Objective

- To understand the impact of the mining and industrialization on food security (resources of production/collection: land/soil; water - river and other irrigable sources - and forest), livelihood resources and practices: Agriculture, Fishing, Forest produce.
- To understand the general impact on the quality of life in the sample villages in the mining and industrial belt (road, drinking water, availability of electricity, drinking water and sanitation, status of health, access to health services, irrigation, employment, etc.)

Scope of the study

Socio-economic

- To understand the change in the status of the agricultural land holding, Common Property Resources, the reasons there of, quantification of change, time line, the nature and the extent of impact, who are the most impacted and how do they cope.
- To understand the change in agricultural practices, the nature of change and the reasons there of and quantification of change, impact on production, cash income, investment; overall dependence on land based agriculture, who are the most impacted and how do they cope.
- To understand the change in the area of forest, access and availability of forest resources and the reasons there of, time line and quantification of change, the nature and the extent of impact, who are the most impacted and how do they cope.
- To understand the impact on the pattern of availability of water in the river Brahmani, perceived pollution, change in the availability of fish-diversity, quantity, quality and the reasons there of; nature of impact on the fishing community-fish harvest, income; overall dependence on fishing, who are the most impacted and how do they cope.

- To understand the change in the potential sources of irrigation- drying, decrease of flow, pollution, the reasons there of, the time line, overall impact, and who are the most affected and how do they cope.
- To understand the overall change in quality of life (because of mining, industry)- who are benefited and how and who are not benefited and how.

Scientific (technical)

- To generate scientific/ technical understanding the phenomenon of soil degradation- the mechanism of degradation (causes), the type and extent of degradation (seasonality), potential impact on crop growing, and linkage with the community perception (mining, dumping, run off from dumping/mines, dust, moisture loss, any other), future threats.
- To generate scientific/ technical understanding regarding the degradation of the potential sources of irrigation (drying, decrease of flow, pollution)- the mechanism of degradation (causes), extent of degradation (seasonality) and impact on end uses, and linkage with the community perception (drying up, impact on crop growth and yield, quality of yield, pest attack, irritation, impact on animals), future threats.
- To generate scientific/technical understanding relating to the impact on trees/plants, undergrowth, forest resources- what caused the impact and linkage with community perception, future threats.
- To generate scientific/technical understanding regarding the change in the fish resources and other aquatic resources of economic importance to the community in the river Bramhani down stream of Samal barrage, what has caused the change, level of pollution, decrease in fish population/diversity, substantial decrease in particular fish species, and linkage to the community perception of depletion of particular fish resources, future threats.
- To generate understanding relating to the potential future threat in the above aspects.

Legal aspects

- To generate legal understanding relating to right to sustainable livelihood in the context of the areas of study- access to core resources of livelihood - land, forest, water with focus on the river Bramhani - the adverse impact on the livelihood of large section of the communities living across the river up to the coastal areas, most of whom are not part of any direct benefit /compensation relating to the mining and industrialization. Critique on the existing legal instruments, their function and adequacy and inputs for building up case/argument for need of legal instruments for protection of common resources with potential long chain impacts- economical, cultural and ecological.

Methodology and the sample area of study

- The study to involve two levels in respective aspects as detailed above: study of materials available at the secondary sources to generate an overview from the perspective of the State and the larger linkages with the micro level field study in the sample area.
- For generation of documented information the micro-study to involve random Focus Group Discussions (FGD), physical transect, interview (both in the sample villages and in the region in general) as per checklists/ frameworks prepared against respective aspects.



'Ash slurry' being pumped to the 'ash ponds' - NTPC, Kaniha)



'Ash' - deposit on the shores of Nandira - about 7 years after the NALCO 'ash pond' breach

- Sample villages: Four villages selected on the basis of information, and observation from the community during the reconnaissance visit in May, 07. The villages represent the mining and industrilisation induced impact on food security, livelihood and the natural resources- one village from the coal mine area, one with 'ash-ponds' in the vicinity and the problem of pollution in the potential irrigation channels, one village with fishing community just below the Samal barrage and the fourth one along the river Bramhani about 40 kms. downstream the Samal barrage.

Studies reveal that in Orissa about 30 million people are affected in the coal mining belt of Talcher and the IB valley. About 1015 ha are affected due to dumping in the Talcher area. Estimates also show that about 10 billion litres of ground water pumped every day during mining, which end up in local water systems. On the average 36MT of coal is being extracted annually. Raw water to the extent of about 86.26 Mcum/annum is drawn from the river for industry/mining activity (apart from other surface & ground withdrawals). Effluent from different industries end up in local water channels. Water shortage and pollution affects communities along the Bramhani river up to the coastal areas. Going by the present enthusiasm for captive power based plants and other heavy industries there will be tremendous pressure on coal and water mining.



"Loaded" water in the river systems in Talcher - Angul region:
Nandira at Kamalanga and Bramhani at Tumungala



Nandira meets the river Bramhani at Kamalanga: 'Fly - ash' is still present along its shores even 8 years after the breach in one of the NALCO's 'ash ponds'

Orissa Vulnerability Factsheet

Climatic hazards: population affected and property loss

- Annually >1 lakh people are affected from coastal districts
- Flood & Cyclone accounts for 93 % of the population affected
- Orissa has recorded an average annual loss of Rs 924 m - 35% due to cyclones and 65% due to floods
- The trend of damage is increasing over the years
- On an average 23,500 houses are destroyed annually
- Annually, 580 people die due to climatic hazards - shows an increasing trend since 2000

Flood

- 7.6 million in 2003, 7.5 million in 2001, 6.2 million in 2006, 4.2 million in 2008
- Affected population is mostly from coastal districts
- On an average 3 million people are affected due to Floods
- The number of persons affected by flood is increasing despite of the preventive measures
- Cultivated area affected in 2008 is 4,770 sq.km, shows increasing trend
- In 2001, 35,000 houses destroyed (highest of 1998-2007)
- In 2008, 4 lakh houses destroyed
- Destroyed houses are more from coastal & western districts
- 8,073 houses are destroyed annually
- Loss of crops increasing over the years
- Property loss in 2003 Rs 8,560 million
- Annual property loss Rs 1,953 million
- Human casualty is 92 in 2006, 91 in 2007 & 68 in 2008

Lightning

- Number of Lightning cases Increasing
- Annual occurrence is nearly 130
- Highest no. of incidences in 2006(279)
- Human causality increasing
- Annual average human death is 205
- Highest causality is in 2007 (351)

Cyclone

- 1999 Super cyclone - human death - 9,927
- Jagatsinghpur dist had the maximum death of nearly 5,000
- On an average 993 human causality is due to cyclone
- Nearly 7 Lakh houses were destroyed in 1999 super cyclone
- Most of the houses destroyed were from coastal districts including Khurda and Cuttack
- Nearly 66,500 houses are destroyed annually

Heat wave (1998-2007)

- Annual average human death is 238 (5 times of Flood)
- Highest human death was in 1998 (2042)
- Coastal & North Western districts show higher human deaths

Change in coastline

- Offshore Islands
- Offshore Bars and Spits
- Position of River Mouth
- Tidal Swamps and Mudflats
- Coastal Vegetation and Mangroves
- Erosion and Sedimentation
- Coastline Changes

Matters of concern

- Disaster losses are increasing
- More protected areas are coming under greater flood risk
- Changing pattern of vulnerability: non coastal districts are coming under high risk for floods
- Districts having high human development index are showing higher relative vulnerability
- There is a need to track the relationship between development policy and disaster risk
- There is a scope to believe that the drive for growth and development is generating new disaster risk

(Based on a Presentation by Prof. G. K. Panda, Dept. of Geography Utkal University, 2008)

Published by:

CFC- Eastern Region
C/O: ODAF
NA-204, Neelchakra Apartments, Cuttack Road
Bhubaneswar- 751 006
odafbbsr@gmail.com

2008